

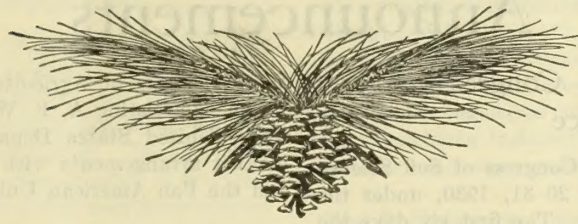
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FOREST WORKER



March, 1930

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UNITED STATES DEPARTMENT OF AGRICULTURE

CONTENTS

	Page
State forestry.....	1
Education and extension.....	6
Forest Service notes.....	10
General forest news.....	15
Foreign notes.....	20
Personals.....	23
Bibliography.....	25

Announcements

Second International Congress of Soil Science

The Second International Congress of Soil Science will be held in Russia July 20-31, 1930, under the presidency of C. C. Gedroiz. The first six days the meetings will be in Leningrad and the remaining time will be spent in Moscow. In each city a series of excursions will be arranged. Exhibits will include special displays devoted to forest soil science. After the congress an excursion of 29 days will be made across the soil zones of European Russia, during which the members will have the opportunity to visit higher schools, agricultural experiment stations, and agricultural and industrial enterprises.

Inter-American Conference on Agriculture, Forestry, and Animal Industry

September 8-20 is the time decided on for the Inter-American Conference on Agriculture, Forestry, and Animal Industry to be held this year in Washington, D. C. Each nation in North, Central, and South America is being asked to send an official delegate and other delegates who are specialists in agricultural production and marketing. Leon M. Estabrook, who for the past five years has been in charge of the

World Census of Agriculture, with headquarters at Rome, is assisting A. F. Woods, director of scientific work, United States Department of Agriculture, in making arrangements with the Department of State and the Pan American Union for the conference.

Georgia Commercial Forestry Conference

A Georgia Commercial Forestry Conference will be held at Savannah May 26-28. It will be arranged by a committee of Georgia citizens appointed at a meeting of representatives of the Georgia Forestry Association and the United States Chamber of Commerce. Various phases of the problem of developing the full commercial possibilities of forest land in Georgia are to be considered, including fire protection, reforestation, improvement of turpentine and logging methods, and more complete utilization. In conjunction with the conference the Georgia Forestry Association will hold its annual meeting.

National Conference on State Parks Meets in June

The National Conference on State Parks will hold its tenth annual meeting at Linville, N. C., June 17-20, 1930.

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FOREST WORKER

Washington, D. C.

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State Forestry

Massachusetts State Forests Provide Work for Unemployed

The place of State forests in the economic structure of a State was recently illustrated in Massachusetts when Governor Allen allotted to the department of conservation a special appropriation of \$25,000 to be used in relieving unemployment. The Governor had determined that the department could in this way provide employment to men in widely scattered sections of the State and, since the regular employees of the department could provide the necessary supervision, with no overhead expense. As a result the department took on more than 300 additional men from 42 towns and put them to work on 25 State forests for five weeks during February and March. The overseers of the poor in the various towns and cities enabled the department to get into touch with the men and in many instances the towns furnished trucks to transport the men to the forests. The men were hired mostly from factory towns. Most of them had had no employment for weeks or even months. They were paid from \$3.50 to \$4 a day. Rather simple work was assigned to the men, as many of them were unaccustomed to woods work; but a surprising percentage of them showed efficiency with ax and brush hook, the conservation department reports. Forest roads were brushed out, young woodlands thinned, release cuttings made in plantations, brush land cleared for planting, and slash on cut-over lands cleared and burned.

Maine Reduces Fire Protection Tax for 1930

Decreases in forest fire protection costs in Maine during the last few years have resulted in the building up of a surplus of \$175,000 in the State's forest fire protection fund. As a result the Governor and Council, acting on the suggestion of Forest Commissioner Violette, have reduced the rate on the forested district by three-fourths of a mill for 1930, making it 1½ mills. Instead of raising \$165,000 by taxation during the year for protection against fire the State will raise only about \$110,000.

Virginia Commercial Forestry Conference

The Virginia Commercial Forestry Conference held in Richmond February 11 and 12, under the sponsorship of the Virginia Chamber of Commerce and with the assistance of the United States Chamber of Commerce, had a registered attendance of 167. Unregistered attendance included 17 members of the State legislature who were present at the banquet on February 11.

John R. Hutcheson, director of the extension service of the Virginia Agricultural College, and Wilson Gee, professor of rural economics and rural sociology in the University of Virginia, opened the program with discussions of the effect of agricultural depression on land use in Virginia. State Forester Chapin Jones gave a talk on Virginia's forest situation. Thomas L. Farrar, a member of the State commission of conservation and development, brought forward the commission's State forest program, under which it is proposed to create State demonstration forests on a scale of about 10,000 acres to each county. Thomas W. Ozlin, former speaker of the Virginia House of Delegates, expressed himself as strongly in favor of this plan, and Max Fleischer, State president of the Izaak Walton League, spoke in support of it as a representative of that organization. W. L. Gooch, forester of the Hummel-Ross Fibre Corporation, and P. Ryland Camp, vice president and general manager of the Camp Manufacturing Co., represented private forestry. Wilbur O'Byrne, State extension forester, spoke on the possibilities of profit from farm forestry. James O. Hazard, assistant State forester, described the State's present tree-planting and nursery practice and estimated what could be done within 20 years to reforest Virginia's unproductive acres.

As a banquet speaker R. Y. Stuart, chief of the United States Forest Service, brought out the point that, although land utilization and other surveys should be made, it is not necessary to wait for the completion of such studies before tackling the obviously necessary and desirable tasks such as acquisition of State forests and protection of forests from fire.

Axel Oxholm, director of the National Committee on Wood Utilization, United States Department of

Commerce, summarized the results of the wood-waste survey made in Virginia by that committee with State cooperation, which indicated an annual waste in the State of 28,000 carloads of wood. J. Elton Lodewick, of the Virginia Polytechnic Institute, discussed the recent development in Virginia of industries using forest products, stating that the lumber consumption of the furniture industry in Virginia increased by 500 per cent in the period 1911-1928, inclusive. Fred R. Fairchild, director of the Forest Taxation Inquiry of the United States Forest Service, outlined problems of forest taxation.

Resolutions adopted by the conference urge that a soil survey of Virginia be completed as soon as possible; that State and Federal forestry activities be encouraged and supported by more adequate appropriations; that fire protection be extended to cover the entire forest area of Virginia; that provision be made for a thorough study of the effects of the present system of forest taxation in Virginia and in other States; that forest management on private lands be encouraged; that forest areas be acquired by the State through purchase or otherwise for purposes of demonstration, experiment, watershed protection, recreation, and protection of wild life; that reforestation be encouraged in the State; that facilities be provided for instructing and assisting farmers and others in the economical production and disposal of forest products; and that existing agencies assist in the utilization and disposal of forest products.

The conference led to the forming of a Virginia Forestry Association, the president of which is W. D. Tyler, of the Clinchfield Coal Corporation, Dante, Va. Vice presidents of the new association are ex-Gov. E. Lee Trinkle, Roanoke; P. Ryland Camp, Franklin; and Milton E. Marcuse, Richmond. The directors are J. C. Phillips, Tappahannock; T. J. Wright, Norfolk; Ellis Olsson, West Point; I. J. Ozlin, Kenbridge; A. N. Carroll, Rocky Mount; D. H. Barger, Shawsville; H. S. Hedger, Charlottesville; Max Fleischer, Gordonsville; A. J. Russell, Tazewell; and I. M. Gathright, Covington.

Vermont Village Has Had Community Forest for 30 Years

The village of Essex Junction, Vt., has had a community forest since 1900. In that year the village purchased 10 acres of land surrounding springs from which it derives water. Later purchases have gradually extended the area to 752 acres of watershed land, the total cost of which has been \$8,800. In 1923, 1924, and 1925, 150,800 trees were planted on this land. Since 1923 the village has sold \$12,179 worth of logs and cordwood from the forest. The water commissioners estimate that there are now on the forest approximately 600,000 feet of standing timber and 2,500 cords of wood that are marketable.

Massachusetts Town Forests

During 1929 the area in town forests in Massachusetts was increased by 84.6 per cent. There are now in the State 86 town forests aggregating 19,504 acres. The appropriations for these forests total \$119,000 and the number of trees planted on them up to the end of 1929 was 2,663,000. Under its offer to plant 5,000 trees free of charge as a planting demonstration for any city or town that will set aside 100 or more acres as a town forest the Massachusetts Forestry Association has planted 190,000 trees on 38 city and town forests.

About 50,000 acres of land in addition to that classified as town forests is owned by cities and towns of the State in their watersheds.

Fire Records Broken in New York

The 1929 report for the New York fire districts shows less burned-over acreage than that of any previous year, although the number of fires exceeded the average for all previous years of record by 95 per cent. According to figures compiled by the State conservation department the year's fires numbered 826, but covered only 25,122 of the nearly 9,500,000 acres of land included in the districts. The average area burned over per fire, 31 acres, was only one-third of the average recorded for preceding years. The 1929 fires burned about one-fifth of 1 per cent of the entire protected area, divided about equally between areas bearing tree growth and open land. Blame for causing 42 per cent of the fires was laid to careless users of smoking materials and 15 per cent of the fires were charged to campers, hunters, and fishermen. The burning of brush and rubbish was found to account for 17 per cent and railroads were held responsible for 12 per cent.

In the fire towns of the Adirondack and Catskill sections, which include most of the State-owned forest land, 349 fires occurred during the year November 1, 1928-November 1, 1929, burning over 1,584 acres. The area burned represented about one-fiftieth of 1 per cent of the total area under protection and about one one-hundred-and-twenty-fifth of 1 per cent of the tree-covered area. Except in 1928, such a small burned area was never before recorded for the fire towns. The average area per fire was about $4\frac{1}{2}$ acres, the smallest of record. Fires were classified by cause as follows: 31 per cent, smokers; 30 per cent, fisherman, hunters, and campers; 10 per cent, brush and rubbish burning; and 10 per cent, railroads.



Title to 11,000 acres of land along the headwaters of the Savage River, Garrett County, Md., has recently passed to the State. This and an adjoining area of 5,000 acres purchased two years ago now compose Maryland's largest State forest.

1929 Fire Record for California

More forest, brush, and grass fires occurred in California during the notably long, dry season of 1929 than in any previous year since organized fire protection has been in force in the State, according to a combined report of the United States Forest Service and the California Department of Natural Resources covering fires on State, Federal, and privately owned land. A total of 4,803 fires that burned over 1,153,462 acres and caused damage amounting to \$2,773,245 was the past year's fire record. These damages combined with the money spent by State, Federal, county, and private forestry agencies in preventing and suppressing fire made up a fire bill of more than \$5,500,000. (This figure does not include the \$1,250,000 property loss caused by the Mill Valley fire, which started within city limits on the brush slopes of Mount Tamalpais.) Compared with the record of 1928, that of 1929 shows an increase of 632 fires; the area burned, however, was smaller by 400,000 acres than in the previous year, and the total damage was \$100,000 less.

Man-caused fires showed a marked increase, numbering 4,424, or 92 per cent of the total number of fires, in 1929 as compared with 3,567, or 85 per cent of the total, in 1928. A large measure of the increase in man-caused fires is attributed to incendiaries, who set a total of 790 conflagrations that burned 589,172 acres and caused damage amounting to more than \$1,000,000.

Careless smokers ranked next, setting 1,631 fires that burned 282,329 acres and did \$518,225 damage. Carelessness in burning brush and debris caused 786 fires that resulted in damage estimated at \$204,463. Campers caused 253 fires; railroads and lumbering caused 170 and 118, respectively. Damage from railroad fires was estimated at \$342,941, resulting largely from a single disastrous fire that occurred on the Modoc National Forest during a period of high winds.

Through cooperation of the United States Weather Bureau, the United States Forest Service, and the California Division of Forestry, forest fire fighting in California is now facilitated by fire weather forecasts made at the scene of the fire. A special truck has been equipped with meteorological instruments for making local forecasts, and has direct connections by radio with the main forecasting office of the Weather Bureau in San Francisco. Last summer the State put into service four fire trucks equipped with tools, hose, water tanks, and supplies for fire fighters, for general utility work on forest, brush, and grain fires. Four additional fire trucks are in process of construction for the 1930 season. The Forest Service operates in California 11 fire-patrol trucks equipped with fire-fighting tools, power water pumps, hose, and supplies, and 5 large tank trucks for use along roads and in towns, villages, or summer camps. In 1929 the Forest Service constructed 286 miles of firebreaks and about 500 miles of motorways and roads primarily for the purpose of fire prevention and control.

Georgia's Fire Score Low in 1929

In 1929 fires covered only 10,588 of the 1,212,071 acres of land in Georgia for which organized protection was provided, according to records compiled by State Forester B. M. Lufburrow. In contrast with a burned proportion of less than 1 per cent on protected lands, on unprotected lands the proportion burned over during the year was 22 per cent.

Forest fires occurring in the State during the year were listed by the Georgia Forest Service according to cause as follows: Burning for grazing, 5,314; incendiary, 2,324; railroads, 1,662; smokers, 1,411. Other fires were charged to turpentine and lumbering operations, campers, brush burning, and lightning.

Forest fire protection in Georgia in 1929 represented the expenditure of \$62,298 of State, Federal, and private funds.

Fires of 1929 Cover 2,000,000 Acres of Arkansas Timberland

Information derived chiefly from county agents' reports indicates that 7,866 forest fires burned over a total of 2,061,820 acres of Arkansas timberland in 1929, the extension service of that State reports. This total is 330,000 acres above the average for the period 1924-1929. Bradley County reported 200,000 acres burned and Drew County reported 150,000. The largest burn reported was in Randolph County, where a single fire burned over 50,000 acres.

New Forest Protection Unit Established in Texas

Gibbs Bros. & Co., the Foster Lumber Co., and the Delta Land & Timber Co. have agreed to cooperate with the Texas Forest Service in establishing a large forest fire protection unit in southern Walker and northern Montgomery Counties, Tex. The unit involves 111,293 acres of timberland owned by the three lumber companies and an almost equal area owned by smaller companies and farmers. In preparation for placing this area under protection at the beginning of the 1930 fire season a 97-foot steel tower has been erected on a high point about 13 miles south of Huntsville.



Additions to Maine's fire protection system during 1929 included two new towers, 175 miles of telephone line, 6 storage houses for equipment, and a number of tool boxes. Two old towers were replaced.



Governor Franklin Roosevelt of New York, who owns timberland surrounding Warm Springs, Ga., is leading a movement to establish a 100,000-acre timber-protective system in Meriwether, Talbot, and Harris Counties, Ga.

New Hampshire Supreme Court Hands Down Opinion on Constitutionality of Forest Taxation Bills

The Supreme Court of New Hampshire has given an adverse opinion on the constitutionality of certain provisions of the forest taxation program introduced in the legislature of 1929, but has suggested substitute measures for accomplishing similar ends. The tax-revision program was not acted upon at the 1929 session of the legislature, in which it was introduced by an interim commission, but at the Governor's request was held over in its entirety in order that an advance opinion as to the constitutionality of the various bills involved might be obtained from the supreme court. The opinion given by the court in reply to senate resolutions is in part as follows:

House bill No. 5 provides for the exemption of standing wood and timber from taxation upon the owner's entering into a contract with the State to pay 10 per cent of the stumpage value at the time of severance. It is entirely clear that the act is not within the limits fixed by the constitution. It undertakes to make tax liability a matter of bargain and sale at the option of a certain class of property owners. Others have no such option. * * *

It has been urged in argument that the plan is sustainable under the doctrine of *Keene v. Roxbury*, 81 N. H. 332. That case is not authority for granting an optional exemption to members of a class of taxpayers. It merely sustains the laying of a charge upon one municipality to be paid by another, when the latter discharges public obligations that are of benefit to the former.

The claim that timber growing is a matter of general public interest, for the promotion of which a tax might be laid, is true only to a limited extent. * * * There is no power to lay a tax to be expended as a bounty to individual timber owners. * * *

While the plan proposed by the bill is thus objectionable, we are of opinion that a similar result may be reached by the enactment of a general law removing standing timber from the class of taxable estate and imposing a tax thereon to be levied when the growth is severed from the reality. * * *

Denial of the benefits of this form of taxation to owners of tracts of less than 5 or more than 500 acres is not permissible. Small amounts of property are sometimes exempted from taxation because of the presumed poverty of the owner or because the cost of assessment and collection would be unreasonably out of proportion to the tax. But these reasons have no application here. It has never been suggested that poverty was a reason for laying a tax upon those thus unfortunate; and as to expense, the proposed provision would call for laying and collecting many taxes instead of one.

Nor can taxes be increased in ratio because the individual taxpayer owns more property than his neighbor. All taxes on like property and for like purposes must be equal.

The court affirms the constitutionality of a bill proposing to devote to the encouragement of forestry and the equalization of tax burdens the net revenue derived by the State from taxation of gas and electric utilities, from a tax upon personal incomes, and from

severance fees to be received under an act exempting standing wood and timber from taxation in certain cases. In so doing it makes the following statement:

It is understood that the object in the State forest project is threefold. It stabilizes the flow of streams, thereby improving water powers and water supplies; it provides natural attractions in the nature of public parks, and it promotes scientific timber growing by individuals through the practical example of its capability to yield profit.

Speaking of the distribution of tax funds to towns containing timber exempt from taxation the court says:

As we understand the situation, the legislature deem the added burden too great to be borne by the towns. If the State can not help, the project must fail. The project, as before stated, being one of state-wide interest, it seems plainly to follow that the State can properly aid in the way proposed. Although the loss is local, the gain is thought to be state-wide.

Replying to queries contained in resolutions of the House the court states the opinion that it is reasonable to classify timber as taxable or nontaxable according to its size; that in thus classifying timber discrimination between different species is warranted if based upon known facts as to rapidity of growth, marketable size, etc.; that a tax upon the annual increment of timber appears to be in the nature of an income tax, laid because property has come into the possession of the owner within the year and laid but once, and that being of this nature it must be coordinated with other income taxes and can not be laid at a rate and of a date different from those of other income taxes. The opinion of the court on a bill to make volume per acre the test of taxability is as follows:

If this were in fact a reasonable method of ascertaining the age or maturity of the growth, the proposed test would be unobjectionable. In some cases it would be so. But there must be many instances where scattered but mature growth would be exempt under this provision. The question, whether these would be so occasional and incidental that they might reasonably be disregarded in prescribing a general test, is one of fact. But with such knowledge as we have of the situation it is our opinion that they could not be so treated and that the proposed test for taxability would therefore be invalid.

Rutland's City Forest

Rutland, Vt., has a city forest of about 3,500 acres surrounding the small brooks and springs that are the source of its water supply. The city entered upon a reforestation program in 1916 and has now planted 516,000 trees. Cutting operations are in progress on a portion of the area that was purchased in 1927. Between November, 1927, and April, 1929, gross receipts for cordwood and logs cut were \$8,890. The city has erected informative signs along the main State highway, where planted northern white pines have reached heights of from 25 to 30 feet.

Thirty-seven Vermont municipalities now have forests, totaling 8,725½ acres.

Forest Trees Planted at Fort Macon State Park, N. C., in Effort to Fix Sand Dunes

By F. H. CLARIDGE, North Carolina Forestry Division

At Fort Macon State Park, Beaufort, N. C., the State division of forestry is experimenting in the fixation of sand dunes through forest plantings. About 412 acres of typical sand-dune land contained in the park was deeded by the Federal Government to the State in 1924. This area is part of Bogue Bank, which separates Bogue Sound from the Atlantic Ocean. It presents a problem typical of thousands of acres from Virginia to Florida. The present growth on much of the land consists of grasses such as sea oats. A considerable portion of the area is in the shifting sand stage. The scattered thicket formations contain yaupon, live oak, and eastern red cedar. The problem seems to resolve itself into fixing the forward dune and afforesting or reforesting the area protected by this forward dune.

The first planting of trees behind the dunes at the park was made by the forestry division in February, 1927. These first plantations were greatly damaged by sheep which roamed up and down the banks; however, some maritime and loblolly pines planted in this first effort as 1-year seedlings have now reached a height of 36 inches. Plantings of several different species of pines made in 1928 and 1929, after the sheep had been removed, have survived in percentages ranging from 81 per cent to 15 per cent, according to species and site conditions.

It is too early to make any definite predictions in regard to the success of these plantings; but indications are that loblolly, maritime, and slash pines will do best on these areas. It has been shown that young pines once established on the areas will grow well. Wind and sand action will probably be the limiting factors when the trees get above the protecting sea oats and other herbaceous growth.

This spring an experimental planting was made to try the fixation of the forward dune with sea oats (*Uniola paniculata*). Three staggered rows of rooted plants were set out about 7 feet apart over about one-fourth mile of beach.

Shade trees were planted for a distance of 38 miles along Alabama's State highways in the first quarter of 1930 through joint effort of women's clubs, the State highway department, the board of administration, and the commission of forestry. Plantings were made in widely scattered locations. The stock, which was of many different species, was obtained from the State nursery, commercial nurseries, the woods, and the gardens of club women. In most cases the trees were spaced 66 feet apart.

Texas Lumber Company Undertakes Large Project in Planting Slash and Longleaf Pine

The Angelina County Lumber Co., of Texas, ordered 20,000 slash pine and 180,000 longleaf pine seedlings from the State forest nurseries near Conroe and Kirbyville for use in a planting operation begun January 27, 1930, on cut-over land owned by the company near Nancy, Angelina County. This company planted 40 acres to longleaf pine in 1929. Its 1930 reforestation project is reported by the State forest service as the largest thus far undertaken in Texas.

This planting in Texas of slash pine, which has its natural range along the coastal plains of Louisiana, Mississippi, Alabama, Georgia, South Carolina, and Florida, is largely experimental. Satisfactory results have been obtained so far, however, in the planting of slash pine at the State forest near Kirbyville, Tex., where more than an acre was planted with this species as a demonstration project in 1926. Measurements made in July, 1929, showed that the trees had made an average height growth of more than 6 feet and that the maximum height growth for the plantation was 10.4 feet.

The city of Little Falls, N. Y., increased its forest planting stock order by 125,000 this spring in order to provide work for unemployed men. This addition would provide about 700 days' work. The city's total order was 325,000 trees, and was expected to increase the Little Falls watershed forest plantations to about 1,500 acres.

The Chemung County Rod & Gun Club, Elmira, N. Y., won the Whipple reforestation cup for 1929 with the planting of 75,000 trees. Of the 20 sportsmen's clubs that submitted records of reforestation work as competitors for the cup, those taking second and third place were the Southern New York Fish & Game Association, with headquarters at White Plains, which reported the planting of 47,000 trees, and the Ilion Fish & Game Club, which reported a total of 25,000 trees.

The plan promoted by the Detroit News for reforestation of State forest land in Michigan, which was described in the Forest Worker of January, 1930, has resulted in provision for the planting of at least 9,760 acres. Under this plan the State forestry division agreed to plant pines on 40 acres of State land for every \$100 contributed toward the work by individuals or organizations. By February 15, \$24,400 had been subscribed.

A State Forest Given to Texas

The State of Texas has received a gift of 600 acres of forest land near Warren, Tyler County. The donor is J. H. Kirby, of Houston. Mr. Kirby has provided that the land shall be used for scientific study of forestry in East Texas and that the net revenues derived from the sale of timber shall be used by the former students' association of the State agricultural college to create a student loan fund at that institution. The tract has been cut over and has on it but little merchantable timber, but does have a fair stand of second-growth longleaf pine.

This is the fourth State forest to be established in Texas.

California has a new State park comprising 3,000 acres of giant redwood forest in Del Norte County, in the northwestern corner of the State. Private contributions matched with funds from the State park bond issue made possible the designation of the new park, which has been named the Del Norte Coast State Park. The park is traversed by 5 miles of highway and includes more than 7 miles of ocean frontage.

In 1929 the fish division of the Michigan Department of Conservation planted 10,408,053 fry, advanced fry, and fingerling game fish and 34,368,900 fry, advanced fry, fingerling, and yearling commercial fish in the waters of the upper peninsula of that State. Of the game fish planted 50 per cent were brook trout and about 25 per cent were perch. Whitefish and lake trout were the principal commercial species planted.

Ohio has three new 65-foot steel fire towers ready for operation—one on Atkinson Ridge, 2 miles northeast of Zaleski, Vinton County; one on Woods Ridge, north of Sciotoville, Scioto County; and one on Rock House State Park, Hocking County.

A second branch office has been opened by the Connecticut Department of Forestry, in Willimantic, with District Forester Joseph Pike in charge. The office is in the Jordan Building, 762 Main Street.

District headquarters of the Mississippi Forest Service, to serve northern Mississippi, have been established at Tupelo, with Assistant State Forester H. C. Mitchell in charge.

In 1930 the Michigan Department of Conservation plans to give added fire protection to Isle Royale, in Lake Superior, by erecting a fire tower and stationing on the island a special fire warden equipped with a large motor boat. Most of the island has no trails or roads permitting access to fires by land. Last year three fires burned over 525 acres of its area, destroying timber some of which was of merchantable size.

In the biennium ending June 30, 1929, the Mississippi Forest Service recorded 2,908 returns on its press releases. During the same period feature articles were prepared by the service on request for most of the daily papers of Mississippi and for a number of newspapers and magazines in neighboring States.

Education and Extension

St. Lawrence University Develops Forestry Program

St. Lawrence University, Canton, N. Y., in following out its plans for forestry extension work made possible by a gift of \$100,000 from F. L. Carlisle and Co. (Inc.), has created the position of associate forester in order to cooperate in county and private reforestation work in Oswego County, N. Y. William J. Endersbee, a graduate of the New York State College of Forestry who has been connected with the United States Bureau of Plant Industry as assistant pathologist engaged in blister rust control work, has been appointed to the position and is stationed at Pulaski, N. Y. Mr. Enders-

bee's principal duty will be to work with the reforestation committee of the Oswego County Board of Supervisors in acquiring and reforesting land under the provisions of the Hewitt Act.

St. Lawrence University plans to reforest 90 acres of land this spring, writes Floyd M. Callward, head of the university's forestry department. One hundred thousand trees ordered from the State conservation department are to be planted on 40 acres along Little River, adjacent to the campus, and 50 acres of the Covey tract in Parishville. The latter area is to be used as a demonstration forest. Plantings will be of northern white, Norway, and Scotch pine, white and Norway spruce, northern white cedar, and European larch.

Yale School of Forestry Holds Third Decennial Reunion

More than 150 graduates of the Yale School of Forestry met at New Haven February 21-22 to celebrate the school's thirtieth birthday. Twenty-six classes were represented. In his welcoming address following a class reunion luncheon Dean Henry S. Graves said: "The school has changed in many ways: In physical facilities, in educational policy, in the scope of its activities, and in the character of its intellectual work. The underlying purposes of the institution remain substantially the same as 30 years ago." Speaking of the expansion of the physical plant of the school, Dean Graves described plans for two additions to Sage Hall—one to run east from the north end of the building, the other to extend south to join Sage Hall with the Osborn Botanical Laboratory. Resources for the east wing have been derived from the bequest of Edward A. Bowers, and the wing is to contain an auditorium in memory of Mr. Bowers. He referred to the development over a period of 25 years of the Eli Whitney Forest, now more than 20,000 acres in extent; to the forest at Keene, N. H., and its development by Professor Toumey as an experimental and research station; and to the 8,000 acres in northeastern Connecticut recently received as a gift from George Hewitt Myers. The permanent funds available specifically for the school of forestry now aggregate nearly \$1,700,000, and about 90 per cent of the school's budget is covered by the resources available specifically for forestry work. Dean Graves characterized the school's first decade as largely formative; its second as devoted to strengthening the courses of study, enlarging the scope of the curriculum, and evolving sound methods of organized instruction; and the third as one of liberalizing the educational work, through abandoning the prescribed curriculum, enlarging and enriching individual courses, adding new courses, and replacing formal class work with individualized work. Other members of the forestry faculty followed Dean Graves with talks on their specialties.

Banquet addresses were made by President Angell and Gifford Pinchot.

On the morning of the second day R. Y. Stuart, Chief of the United States Forest Service, spoke on "The United States Forest Service and the profession of forestry."

Under the leadership of Prof. Ralph C. Hawley, an excursion was made to the Maltby tract of the Eli Whitney Forest to observe results of watershed plantings and improvement cuttings in which successive classes of students had participated under Professor Hawley's direction. Norway pines planted by the class of 1902, pruned to a height of 17 feet, have grown to a diameter of 12 inches. The edges of the reservoirs are lined with a fine growth of evergreens.

Kansas City School Children Campaign Against Bagworm

For four years Kansas City school children have been studying and fighting the most destructive insect enemy of trees in their vicinity, the bagworm, *Lena V. Feighner* reports in *Nature Magazine*. At the beginning of 1926 a general science class in the Central Junior High School made a study of the insect, collecting bags from some trees on the school grounds and obtaining information from the Bureau of Entomology. Members of the class organized a campaign in their school, which in two weeks netted 28 pounds of bags. The class observed emergence of parasites, hatching of eggs, and habits of the insect. Later the project was extended to other junior high and grade schools in the city. The 1928 campaign, in which business men of the city offered silver cups as prizes, resulted in collection of 704 pounds of bags in Kansas City and vicinity. In 1929 prizes were again offered and the schools gathered 325 pounds of bags. Destruction of tree foliage by the bagworm has diminished, and there is evidence that a tree conservation lesson has been learned not only by the school children but by the general public.

Boy Scouts to Plant Nuts from Historic Trees

The American Forestry Association has collected a fund of \$10,000 to be used in furthering forestry activities of the Boy Scouts of America. This fund is to finance a 5-year project in collecting and planting nuts from trees having historic associations. Information as to where historic nut trees may be found will be given to the scouts by the Department of Agriculture and by State foresters and historical societies. Nuts gathered by the scouts will be sent to the experimental farm of the Department of Agriculture at Arlington, Va., where they will be sorted, tested, and hulled. National Boy Scout headquarters will arrange the distribution of allotments of nuts to scout troops in regions to which the different species are adapted. Each consignment of nuts will be accompanied by instructions for planting the nuts and caring for the seedlings.



The department of forestry of the North Carolina State College of Agriculture, established in the fall of 1929, is carrying on field work on the Camp Polk prison farm, which includes about 1,000 acres of timberland. An intensive cruise of about 50 acres has been made this year, and on this area timber is being cut under supervision of the department, the prison providing the labor.

The Wisconsin Junior Forest Rangers

In 1929 F. G. Wilson, extension forester of Wisconsin, had 860 boys in 24 counties enrolled in his junior forest ranger clubs. These boys planted 325,000 tree seedlings provided by the State conservation commission. The junior rangers' annual camp at Wildcat Lake, for which the conservation commission has provided building and equipment, was attended by 63 boys from 13 counties.

The program of woodcraft and forestry work which a Wisconsin boy undertakes when he joins the junior forest rangers is an ambitious one. It is divided into four orders; from the initial grade of "foresterafter" the persistent and successful junior ranger progresses to those of planter, woodsman, and cruiser.

The "foresterafter" must learn to identify the important trees of his locality by bark, fruit, bud, and foliage, and to make drawings, offhand, showing the characteristics of the leaves or the needle clusters of 11 tree species; must mount specimens of the foliage and fruit of 10 trees of commercial value in Wisconsin; must observe and teach care in the use of camp fires; and must pass an examination on forest resources of State and Nation, the location of forest areas, the uses of wood, and the effect of forests on stream flow and wild life. He must make a Biltmore stick and learn how to use it, learn to estimate the diameter of trees, and plant 300 seedlings provided by the State. He must keep a complete record of all this study and work.

The planter is required to continue the work of forest protection, making the acquaintance of the fire warden and game warden of his fire-protection district, learning the warden's protection plans and the boundaries of his territory, and offering to help in some fire-protection work. He must construct a forest nursery, following printed instructions, and plant, under supervision, 600 tree seedlings furnished by the State conservation commission. These seedlings are provided on condition that the 300 seedlings planted in connection with the foresterafter program have been handled with all reasonable care, and that a map is drawn up giving the location of the planting area with respect to other farm plots or the home, showing also plantings already made and projected. He must prepare, mount, and exhibit in some public place ten specimens of wood of trees of commercial importance in his locality, and must learn what woods are best for various uses. He must learn the soil, moisture, and climatic requirements of 11 tree species and must be able to draw the fruits of an equal number, also to draw a diagram of a typical tree and tell the function of each of its parts. He must talk to a school or class or at a public gathering on some phase of his work as a planter, and take part in making a success of Arbor Day or Forest Week observance.

The woodsman must continue forest protection service and forest planting. He must learn to tie

quickly at least 10 kinds of knots and to pace distances with reasonable accuracy, must make a caliper, and must make a collection of insects or of fruit of forest trees. In this order, also, comes the management, under supervision, of a woodland area.

The cruiser, while carrying on the planting and other features of his earlier work, must familiarize himself with the various units of measurement used with forest products and learn to estimate the contents of standing trees and of piles of logs.

For each of the grades a wide variety of optional work is outlined.

All Wisconsin boys 12 to 21 years of age are admissible to the junior forest ranger clubs.

Fire Prevention Poster Contest in Michigan Schools

All Michigan grade and high school children have been invited to try their ingenuity at producing forest-fire prevention posters and slogans for the State's use, in a contest closing March 31. Cash prizes totaling \$110 are offered by the State department of conservation to the five high-school pupils and the five grade pupils whose results are adjudged most effective, with additional awards of \$10 worth and \$5 worth of books, respectively, to the high school and grade school attended by the first-prize winners. Ratings are to be based half on the poster and half on the slogan, and the merits of the idea expressed are to be the determining factor rather than the quality of the drawing.

Oratorical Contest on Forestry for Tennessee School Children

More than 100 children in the grade schools of Fentress County, Tenn., competed last fall in an oratorical contest on the subject "What will well-protected forests mean to Fentress County?" The contest was arranged by District Forester Tom B. W. Watkins, with the cooperation of County Superintendent of Schools O. O. Frogge, and was open to all pupils enrolled in the fifth to eighth grades, inclusive. Printed matter specially prepared for the purpose was distributed to school principals by the State division of forestry in numbers sufficient to supply every eligible child. Oration length was set at from 8 to 12 minutes, and contestants were graded 60 per cent on subject matter and 40 per cent on delivery. After preliminary contests in the individual schools semifinals were held at the centers of the various civil districts of the county. The final contest took place in the auditorium of the Alvin C. York Agricultural Institute, Jamestown, Tenn. Prizes of \$15, \$10, \$5, and \$1 with a history of Fentress County were awarded according to the decision of a committee headed by State Forester R. S. Maddox.

Indiana Manufacturer Distributes Tree Seed by Millions

Frank S. Betz, retired manufacturer of Hammond, Ind., in the year beginning with July, 1928, personally distributed 14,550,000 trees and tree seed to school children, Boy Scouts, corporations, farmers, and others in different parts of Indiana and in other States. Most of these trees and seed were given away; the remainder were sold at cost. More than 2,000,000 of the seed were given to school children in Lake County, Ind. More than 90,000 Indiana school children took part in the planting. This spring Mr. Betz has arranged to give away 25,000,000 pine and spruce seed to rural boys of his State and also to distribute 5,000,000 one, two, and three-year-old pine, spruce, fir, cypress, cedar, and arborvitae trees to school children and Boy Scouts. With each package of seed go illustrated planting instructions adapted to the understanding of a child. Stimulated by Mr. Betz's example, bankers of Lake County have arranged to give approximately 6,250,000 evergreen tree seed to school children of the county for planting this year on Arbor Day, April 18.

Fellowships to be Awarded by Charles Lathrop Pack Forest Education Board

The Charles Lathrop Pack Forest Education Board, recently founded by the Charles Lathrop Pack Forestry Trust, has offered six to eight fellowships for the year 1930-31, the grants under which are to range in general from \$500 to \$2,500. The purpose of the fellowships is to encourage men who have shown unusual intellectual and personal qualities to obtain training that will best equip them for responsible work in the general practice of forestry, in forest industries, in the teaching of forestry, in forest research, or in the development of public forest policy. The fellowships will ordinarily be restricted to men of American or Canadian citizenship; no restrictions are made as to age, educational status, or practical experience. Men still in school and men already engaged in professional work who intend to make forestry their life work are eligible. Grants may be made for study at a school of forestry or an institute of research, on a forest under management, in association with a forest industry, or in travel. Appointments may be made for 12 months or for a longer or shorter period, and may be renewed. Those wishing to apply for fellowships were asked to do so on or before April 15, 1930.

Henry S. Graves is chairman of the board and Ward Shepard is its secretary. The directors are Samuel T. Dana, John Foley, Henry S. Graves, Arthur N. Pack, Ward Shepard, E. O. Siecke, Ellwood Wilson, Hugo Winkenwerder, and Raphael Zon. Headquarters of the board are at 1214 Sixteenth Street N.W., Washington, D. C.

Idaho Black Locust Windbreak Timber ✓ Brings Return of \$50 an Acre

A black locust windbreak in the Twin Falls tract of southern Idaho that was harvested in the winter of 1927-28 gave a financial return of about \$50 per acre per year for the land occupied, this return including compensation for damage to field crops through competition, writes Extension Forester A. M. Sowder. The windbreak, located near Filer, was a single row, one-quarter mile long, of trees spaced about 8 feet apart. A highway bordered it on the west and a field on the east. For half its length there was no ditch between the trees and the adjacent field, so that the trees damaged the field crop through competition. The damage was evident to a distance of about 40 feet, although the crop on this strip was by no means a total loss. The remaining half had an irrigation ditch between the trees and the crop to convey the waste water from the field. Here there was practically no damage to the crop. Thus slightly more than half an acre of ground was taken up by the trees in this quarter-mile windbreak. The financial return to the owner for the timber was a little more than \$500, or about \$50 per acre per year. The limbs of fuel wood size and the very crooked lengths were not utilized, but burned as debris, so considerable revenue was lost. In addition, many posts had been obtained from the windbreak from time to time of which no record was made.

Plans for Spring Planting in Nebraska

Pine seedlings distributed this year to Nebraska farmers by the extension service of that State will be shipped directly to the farmers from the nursery at Halsey, Nebr., instead of being shipped to the agricultural college at Lincoln to be counted and reshipped. The old procedure caused a week's delay and some drying out of the roots. Broad-leaved stock will be handled at Lincoln as before.

Inspections during the past summer of 719 plantings, including some from 1926, 1927, 1928, and 1929 distribution, showed the survival to be slightly less than 50 per cent, Extension Forester Clayton W. Watkins reports, the loss being heavier in evergreen stock. The abnormal loss may be partly explained by extremely dry weather experienced during parts of the last four summers.

Five hundred thousand pines are available at Halsey for distribution this year. The extension service has raised its annual quota of trees per applicant for windbreak planting from 300 to 400. For farm woodland planting 1,000 trees are offered to each applicant.



In December, 1929, the New York State Ranger School graduated 44 men, the largest class of its history.

The West Virginia Game, Fish, and Forestry Commission this season has sponsored its first county forest-fire essay contest, in the schools of Randolph County. Arrangements were made by District Forester H. Y. Forsyth and County Superintendent of Schools Bryan Hamilton. School children were given their choice of the subjects "Forest fires and their relation to the people of Randolph County" and "What can my school do to assist in the elimination of the forest-fire danger?" The county was divided into three districts, in each of which were offered first, second, and third prizes of \$5, \$3, and \$1, respectively. In addition a county prize of \$5 was offered for the most original essay.

Members of the 4-H clubs in North Carolina can obtain forest-tree seedlings from the State nurseries this year with no charge other than for packing, under

the terms of an offer made by the State department of conservation and development and the State agricultural college's extension service. As many as five applications from each county will be accepted, for 500 or 1,000 trees each. The packing charge is 50 cents for each order. Longleaf pine, loblolly pine, and black locust are the species offered.

A course in aerial mapping has been organized at Syracuse University for students of applied science and the New York State College of Forestry. It is headed by Prof. S. D. Saranson. Others on the staff are Prof. Leon B. Howe, instructor in drawing, Prof. Leroy A. Mullin, and Prof. Earl F. Church, formerly with the United States Coast and Geodetic Survey. The course is being financed under an endowment totaling approximately \$60,000 from the Guggenheim Foundation for the promotion of aeronautics.

Forest Service Notes

Seed Yield Averages for Southern Pines

By PHILIP C. WAKELEY, United States Forest Service

As a by-product of various germination and storage tests with seed of the southern pines the Southern Forest Experiment Station is now able to give, for each of the principal species, fairly reliable figures on such points as the average number of seed in a pound and the average yield of seed from a bushel of cones. The available data, representing records of seed from 8 or 10 crops and from such widely separated States as Georgia, Florida, Arkansas, and Texas, are too meager to permit grouping by regions or by climatic cycles. Nevertheless, figures derived from them are useful in

making estimates of the quantities of cones or seed required for planting given areas, of the shipping weights of cones, and of loads on cone-storage floors, drying-rack brackets, and extractor-drum axles. These figures have interest, also, in connection with the development of extraction technique and with the problem of what constitutes a good seed tree. They have therefore been summarized in the following table, "usual averages" being followed in parentheses by the minima and maxima observed at the station for lots of cones and seed not affected by immaturity, loss of seed before collection, improper extracting technique, or abnormal insect injury.

Species	Number of clean seed per pound ¹	Number of green cones per bushel	Weight per bushel of green cones ² (pounds)	Yield of seed per bushel of green cones ³ (pounds)	Per cent of weight lost by cones in drying (based on dry weight) ²	Per cent of weight lost by seed in cleaning (based on clean weight) ³	Per cent of seed with kernels (based on total number)
Longleaf pine (<i>Pinus palustris</i>)	{ 5,200 (4,010-8,000)	{ 100 (86-118)	{ 34 (28-38)	{ 1.50 (1.00-1.93)	{ 105 (87-115)	{ 27.8 (Only 1 record.)	{ 80 (57-86)
Sonderegger pine (<i>Pinus sondereggeri</i>)	{ 13,400 (12,730-14,138)	{ 216 (Only 2 records.)	{ 34 (Only 2 records.)	{ 1.20 (1.00-1.43)	{ 80 (Only 2 records.)	{ 31 (27.4-41.9)	{ 80 (61-85)
Slash pine (<i>Pinus caribaea</i>)	{ 15,500 (13,470-19,660)	{ 500 (393-1080)	{ 32 (26-35)	{ 1.30 (0.81-1.74)	{ 74 (54-93)	{ 26 (16.0-37.6)	{ 65 (37-77)
Loblolly pine (<i>Pinus taeda</i>)	{ 21,300 (17,241-29,264)	{ 350 (Only 1 record.)	{ 31 (Only 1 record.)	{ 1.30 (0.83-1.83)	{ 75 (36-98)	{ 30 (19.5-56.8)	{ 68 (42-83)
Pond pine (<i>Pinus rigida serotina</i>)	{ 56,000 (53,230-61,250)	{ 2,200 (1,441-2,545)	{ 37 (30-42)	{ 1.30 (0.83-1.83)	{ 75 (36-98)	{ 30 (19.5-56.8)	{ 68 (42-83)
Shortleaf pine (<i>Pinus echinata</i>)	{ 69,200 (41,614-84,985)	{ 2,200 (1,441-2,545)	{ 37 (30-42)	{ 1.30 (0.83-1.83)	{ 75 (36-98)	{ 30 (19.5-56.8)	{ 68 (42-83)
Sand pine (<i>Pinus clausa</i>)	{ 74,400 (70,280-78,550)	{ 2,200 (1,441-2,545)	{ 37 (30-42)	{ 1.30 (0.83-1.83)	{ 75 (36-98)	{ 30 (19.5-56.8)	{ 68 (42-83)
Spruce pine (<i>Pinus glabra</i>)	{ 77,500 (Only 1 record.)	{ 2,200 (1,441-2,545)	{ 37 (30-42)	{ 1.30 (0.83-1.83)	{ 75 (36-98)	{ 30 (19.5-56.8)	{ 68 (42-83)

¹ Figures are for seed from which all impurities, including aborted or broken seed, have been eliminated, and, except in the case of longleaf, from which the wings have been removed.

² Green weights of cones are probably a trifle low, because they were usually obtained at the extracting plant instead of in the woods. They give a fair approximation of shipping weights.

Figures are for "commercially clean" seed containing a varying quantity of impurities, but with wings removed except in the case of longleaf.

The opening of green cones is shown by the records to result in expansion to two or even three and one-half times the volume of the unopened cones. In distributing cones on the drying racks allowance should be made for the maximum expansion. Drying racks should be approximately 4 inches deep for shortleaf, 6 inches deep for loblolly and slash, and 8 inches deep for longleaf pine cones; at least, they should clear by these measurements, bottom to bottom, when arranged in tiers. With such clearance a 2 by 4 foot rack will hold 1 bushel of green cones of longleaf, three-fourths bushel of slash, one-half bushel of loblolly, or three-eighths bushel of shortleaf pine cones.

Of the four species just listed longleaf pine cones take the longest time to open, as might be expected from the structure of the cone and the large amount of water to be removed in drying. Shortleaf cones seem to be the most apt to open poorly; some lots of shortleaf give no trouble, but others are exceedingly stubborn.

Freeing the seed from their wings is less difficult with slash than with either of the two other commercially important species for which this is usually done (longleaf pine seed are not "winged"), and is much the most difficult with loblolly.

Experience at the southern station has shown that pine needles are more easily and cheaply removed before the cones open. When the needles are once broken and mixed with the extracted seed, it is difficult or impossible to get them out.

It may be remarked that under ordinary nursery conditions the germination percentage of fresh southern pine seed approaches very closely the percentage of seed containing kernels, and that the stand of seedlings in most southern nurseries is too dense.

New Method of Preservative Treatment Makes Engelmann Spruce Available for Use as Railroad Ties

One of the most perplexing forest utilization problems of the Engelmann spruce regions was recently solved when the Forest Products Laboratory demonstrated the possibility of giving wood of this species preservative treatment fitting it for use as railroad ties. The treating methods formerly used for this wood did not give satisfactory penetration either in sapwood or in heartwood. Consequently the railroads accepted only limited quantities of it, and that under some protest. This has complicated the problems of managing forests in Colorado, Wyoming, and Utah containing large quantities of Engelmann spruce, for which there has been a very limited market.

The new method of treatment after being evolved at the Forest Products Laboratory, Madison, Wis., was demonstrated by J. D. MacLean, of the laboratory staff, at the creosoting plant of the National Lumber & Creosoting Co., Salida, Colo., with narrow-gage and standard-gage Engelmann spruce ties furnished by

the Denver & Rio Grande Western Railroad Co., and later at the Union Pacific Railroad's treating plant at Pocatello, Idaho.

The method involves careful control of the treating temperature, the treating pressure, and the pressure period. Either zinc-chloride solution, coal-tar creosote, or creosote-petroleum mixtures may be used. Regardless of the treating pressures employed, preservative temperatures of about 190° to 200° F. are necessary.

Doctor MacLean's tests at Salida showed that the air-seasoned Engelmann spruce ties on hand there could be given a creosote penetration of about one-third inch in the heartwood and more than one-half inch in the sapwood. The ties treated at Salida were not incised. The preservative used was a mixture of 55 per cent grade 1 coal-tar creosote and 45 per cent petroleum oil. In all but one of the treatments a total pressure period of about six to eight hours was used in order to have pressure applied about four to six hours under the maximum temperature. In most of the treatments preliminary air pressures of 25 and 30 pounds were used.

The ties used in the experiments at Pocatello were incised by running them through a machine that punches holes or slots in the surfaces, with the result that much better penetration was obtained. In all the experiments at this plant the preservative used was the standard mixture employed at the plant, 50 per cent petroleum oil and 50 per cent grade 1 coal-tar creosote. In all these tests the total time of treatment was less than eight hours, even when a final vacuum period of one and one-half hours was used.

In order to avoid injury from collapse and checking, it was found, the difference between the preliminary air pressure and the treating pressure should not be much above 125 pounds.

Because of the long time that would be required to season Engelmann spruce ties by artificial means in the treating cylinder preparatory to treatment with preservative oils, Doctor MacLean observes, air seasoning is much more practical and economical.

Zinc-chloride solution was found in the laboratory experiments to penetrate Engelmann spruce very much better than preservative oils. Under treating conditions such as are recommended, the solution completely penetrated the sapwood and gave average penetrations of one-half inch and more in the heartwood of both green and seasoned unincised material. Since this species takes much deeper penetrations of the water solution than of preservative oils under the same conditions of treatment, consideration should be given to the possibility of employing a 2-movement treatment for ties. The zinc chloride could be used to protect the wood against decay, and petroleum oil alone might be found suitable for protection against checking and splitting and to help retard leaching of the preservative salt.

Thinning Lodgepole Pine Stands on the Minidoka

By S. S. STEWART, United States Forest Service

In lodgepole pine stands on the Minidoka National Forest, Idaho, silvicultural operations have been developed to an advanced stage. This has been made possible by the fact that on the agricultural lands tributary to the forest there is a widely distributed population demanding forest products ranging from sawlogs to fence stays. Numerous small communities building up from a pioneer stage have required millions of board feet of logs, poles, posts, stays, fuel, etc. Dry material, much sought after owing to ease of handling, has been completely utilized, and within the last decade the demand for green material has steadily increased. This has permitted silvicultural improvement of the stands through the removal of diseased, defective, and inferior trees and through genuine thinning of stands approaching stagnation in growth.

Cutting plans have been developed for each ranger district, on the basis of detailed surveys. In these plans definite areas are listed according to age, density, or diseased condition of the timber. Sales will be directed into these areas for the next five or ten years, or until the timber on them is satisfactorily thinned.

While the present stands of lodgepole pine on these areas are largely immature and crowded, the trees have reached diameters of 3 inches or more and are merchantable for small building logs, fence poles, hay derricks, etc. Through the removal of part of the stand an immediate financial return is realized. The cutting is done by the farmers under timber-sales permits or contracts and at a fair return to the Government for its stumpage. The quantities of merchantable timber thus taken out vary widely but probably range from 50 to 250 trees per acre, depending of course upon the original density of the stand. Stumpage values for the material removed range from \$2 or \$3 to as much as \$25 or \$30 per acre. The demand varies somewhat from year to year, depending on the success or failure of the leading agricultural crops. Trees 3 to 9 inches in diameter marked for removal from all stands on the forest scheduled for cutting totaled about 29,000 in 1928 and about 20,000 in 1929.

In selecting individual trees to be cut attention is centered on removing trees of poor form and those infected with mistletoe or other diseases, and on obtaining uniform spacing, so far as possible, in the residual stand. The degree of density of the remaining stand is determined largely according to its age, the soil conditions, and general windfirmness. A long, slender stem with a mere tuft of limbs at the top is almost certain to be windthrown or to be bent over when laden with snow. These dangers are largely eliminated when the poles have grown to diameters of 5 or 6 inches. The best crowns are well balanced all around and occupy from one-third to nearly one-half the length of the tree.

From 250 to 500 trees per acre are left. In terms of basal area this amounts, for the few cases calculated, to from 130 to 140 square feet per acre.

An administrative provision requires that purchasers meet the ranger on definite days of the week or month at given points on the district for discussion of the conditions governing the sale—its contract provisions and the principles of selecting and marking the trees.

By opening up the stands and freeing them from disease these cultural operations hasten maturity of the major crop by from 20 to 50 years, besides greatly improving the quality of the final product.

No effort has been made to extend thinnings into stands in which the trees have not yet reached merchantable size.

Mortality on Cut-over Western Yellow Pine Areas of the Southwest

In order to obtain some definite figures on mortality losses, the greatest element of uncertainty in predicting timber yields in the Southwest, Hermann Krauch, associate silviculturist at the Southwestern Forest Experiment Station, has studied 15 and 20 year records of five sample plots on the Coconino and Tusayan National Forests, Ariz. All the plots are in cut-over stands of western yellow pine. The two largest, covering 304 and 456 acres, respectively, were established in 1909. The three others, measuring 112, 139, and 152 acres, respectively, were established in 1913. The stands after cutting ranged from 1,873 to 4,510 feet board measure per acre; the number of trees above 12 inches in diameter at breast height ranged from 3.8 to 13.7 per acre and the diameters ranged as high as 47 inches.

Average annual losses per acre on the two plots established in 1909 were found to have been 8.8 and 20.3 feet board measure, representing annual mortality percentages of 0.36 and 0.58, respectively. For the three plots established in 1913 the average annual losses per acre were 17.7, 19.8, and 29.1 feet board measure, and the corresponding percentages were 0.62, 1.06, and 0.65. Trees above 30 inches in diameter at breast height showed the highest mortality rate, both as to number and volume, except on one area where the rate was higher for trees 21 to 30 inches in diameter than for those 31 to 40 inches in diameter. No marked consistency was apparent in the loss during different 5-year periods after cutting. The two 20-year plots showed a progressive increase from the first to the fourth period. Of the three 15-year plots, two suffered their greatest loss in the first and one in the third period.

On all but one of the plots a greater number of tree deaths was charged to mistletoe than to any other agent. The percentages of the deaths attributed to this cause on the five plots were: 20-year plots, 0 and

55; 15-year plots, 48, 29, and 46. Corresponding percentages for wind throw and wind breakage were 19, 15, 18, 30, and 26. Lightning ranked third as a cause of death, with percentages ranging from 5 to 13. In point of volume wind was responsible for the greatest loss and lightning for the next greatest; both these agents act mainly on large trees, while mistletoe kills relatively few large trees.

Weeding of Sprouts Justified Where Northern White Pine is Planted to Replace Chestnut

It is worth while to weed hardwood sprouts from northern white pine planted on areas where chestnut has been killed by blight, according to results obtained on the Mount Toby Demonstration Forest of the Massachusetts Agricultural College, at Sunderland, Mass. Paul Stickel, of the Northeastern Forest Experiment Station, recently reported the condition of sample plots located on this forest which have been maintained by the station in cooperation with the college since 1924. Two plots are in a northern white pine plantation that was established when the dead chestnut was removed in 1919. A third plot is situated in a stand in which the blight-killed chestnut trees have not been removed. On one of the artificial replacement plots the competing hardwood sprouts have been cut back annually so as to release the pines. Measurements have been made annually on all plots since their establishment.

The 1929 measurements showed that the basal area of the northern white pine on the planted plots is rapidly approaching that of all species on the natural replacement plot. The basal area per acre for northern white pine was 15.9 square feet on plot I (weeded pine plot) and 11.3 square feet on plot II (unweeded pine plot); the basal area per acre for all species was 16.2 square feet on plot III (natural replacement plot). On the natural replacement plot less than 50 per cent of the stand was made up of commercially valuable species.

In 1929 the trees on the weeded plot had an average diameter of 1.8 inches and an average total height of 11.7 feet, and approximately 70 per cent of them were in the dominant and codominant classes. On the unweeded plot, measurement of northern white pines in the same year showed an average diameter of 1.6 inches and an average total height of 11.3 feet; and only 50 per cent of the pines on this plot were in the dominant and codominant classes. The weeding has kept down the height of the hardwood sprouts so that now the pines on the weeded plot overtop the hardwood canopy by almost 3 feet; on the check plot the sprout growth overtops the conifers by 3 feet.

Thus it appears that weeding of hardwood growth in pine plantations on cut-over chestnut lands, while

not absolutely necessary, aids materially in the best development of the planted stock. Where such weeding is undertaken Mr. Stickel recommends that a "broadcast" thinning (cutting back all hardwood sprouts) be made in the first year and that in subsequent years thinnings be confined to releasing individual pines. In the study here described a "broadcast" weeding was carried out in 1925, requiring 32 man-hours per acre, and in each year since then a clump weeding requiring from 6 to 8 man-hours per acre.

Pulpwood Sale of 2,000,000 Cords Offered on Colorado National Forests

A timber sale that would enable Colorado for the first time to take rank as a large-scale producer of pulp timber is now being advertised by the Forest Service. The offer, based on an application from a responsible paper manufacturer, covers 2,000,000 cords of pulpwood on the Rio Grande and San Juan National Forests, in the southwestern part of the State.

Operations under the contracts offered would increase the total annual cut on the national forests of Colorado by approximately 50 per cent. If the annual cut on these forests were increased by 400 per cent it would still remove no more timber than would be replaced annually by natural growth. The operation has been planned so that it can continue indefinitely, covering in rotation a number of tracts large enough so that when the last tract is cut over the first will be ready with a second crop.

Two units make up the "chance" now advertised for sale to the highest bidder—one on the south fork of the Rio Grande, with an estimated total of 1,025,000 cords of Engelmann and blue spruce and 215,000 cords of white and alpine fir, and one on the upper Piedra River, with 800,000 cords of spruces and true firs. Each unit includes saw timber of Douglas fir, western yellow pine, limber pine, and bristlecone pine.



In forest plantings of 1929 in the Northern National Forest District, headquarters of which are in Missoula, Mont., western white pine seed gathered from 17-year-old trees showed a germination percentage of about 27, and that gathered from trees 100 to 120 years old showed one of only about 19. Seed from mixed collections of cones taken from squirrel caches was only 22 per cent viable. D. S. Olson, chief of planting for the district, concludes that seed from the first cones borne by young western white pines may be viable and that natural seeding may commence with the production of cones on such trees. Because of a poor seed crop and for other reasons the comparison was not extended to species other than western white pine during 1929.

Forest Service Celebrates Twenty-fifth Anniversary

On February 1, 1930, the United States Forest Service became 25 years of age. Birthday celebrations were held both in Washington, D. C., where members and friends of the service met for afternoon exercises in the auditorium of the National Museum, and in field offices. For one hour the proceedings of the Washington meeting went on the air over a coast-to-coast radio network of 30 stations furnished by the National Broadcasting Co.

An extensive collection of lantern slides from old Forest Service photographs, some of which exhibited present service administrators in their juvenile stages, were shown and explained at the Washington meeting by E. E. Carter, chief of the branch of forest management. Three of the four men who have served as chief of the service were on hand, and a message was received from the one absent, William B. Greeley. The present chief forester, R. Y. Stuart, presided, and opened the speaking program with a review of the high points of forestry progress in the United States in the last quarter century. Assistant Secretary of Agriculture R. W. Dunlap conveyed the greetings of the department and called attention to the relationship of forestry to agriculture. Senator McNary of Oregon spoke of the benefits that have accrued to the West from the skillful administration of the national forests and expressed his belief in extended acquisition of lands for national forests. He congratulated the service on its administrative success and its winning of public confidence, and on its present opportunities. Representative John D. Clarke of New York reviewed legislative milestones in the progress of forestry and called attention to the new Clarke-McNary bill proposing a still larger program of Federal land acquisition and reforestation. Representative Roy O. Woodruff of Michigan described the forest problem in the Lake States. Representative Scott Leavitt of Montana, once a forest ranger, expressed his gratification over the progress of Federal forestry legislation and the prospect that more adequate funds will be provided for Federal forestry work. Representative Harry L. Englebright of California stressed the forest problem of the West and the need for more adequate fire protection. Former Chief Forester Henry S. Graves spoke of the elements contributing to the success of the work of the Forest Service and of the influence of this success in stimulating State and other forestry undertakings. Gifford Pinchot, first chief of the service, spoke in reminiscence of "the days when the forest lands of the Government had not a single forester to look after them and the foresters of the Government had not a single acre of Government forest land in their charge," and made a plea for conservative handling of forest resources.

The Forest Service was created in 1905 through the merging of the old forestry division of the General

Land Office and the Bureau of Forestry of the Department of Agriculture.

Sitka Spruce on the Tongass Forest Looks South

By R. F. TAYLOR, United States Forest Service

It is realized that in regions farther north or at greater elevations than a given tree's optimum growing region the species will seek south slopes, and vice versa. In the case of Sitka spruce the exact location of the best growing region along the northwest coast is probably not known. It would be interesting to locate a zone where, other factors being equal, the species grows as well on one aspect as on another.

In going over some data on cut-over land on the Tongass National Forest, in southeastern Alaska, I noted that of 13 timber sales only 3 had occurred on northerly slopes, and these had a low percentage of spruce. With this for a starter I investigated 37 areas on which yield studies had been made. On these areas southerly aspects supported 56.2 per cent spruce, on the average, and had an average site index of 73.5 (based on total height at 50 years). North and northeast slopes had but 22.37 per cent spruce and an average site index of 67.5. On southern slopes the site index varied from 60 to 92, whereas on northerly slopes it varied from 40 to 70.

Where is the Mecca toward which the Sitka spruce bows? Does it lean toward the cold Tongass rains in the fog belt of the Northwestern States?

New Films Show Growth Requirements of Forage Plants

Two one-reel motion picture films have been prepared by the Forest Service in cooperation with the Motion Picture Laboratory of the Department of Agriculture to tell the story of grazing on the range as related to plant growth requirements. One, titled "On a Thousand Hills," deals with sheep grazing; the other, titled "Green Pastures," with the grazing of cattle. Most of the photography was done by forest officers on range areas in the intermountain region and in the Southwest.

In these films interest centers on the forage rather than on the livestock. Plant reactions to various types of grazing are shown, such as the stunted root growth of overgrazed forage. Grass is shown growing before the lens, and certain other phases of plant life are presented.

On a Thousand Hills is already available, and Green Pastures will be released within a few weeks. These films may be borrowed free of charges, other than the cost of transportation, by application to the Office of Motion Pictures, United States Department of Agriculture, Washington, D. C.

Experimental Area Designated on Coconino National Forest

An area of 2,420 acres within the Coconino National Forest, Ariz., has been designated as an experimental forest and will be administered by the director of the Southwestern Forest Experiment Station, with the

cooperation of the forest supervisor. Most phases of forest administration will be practiced on the area; special use permits will remain in force, a sheep-driveway will continue, grazing permits will be issued as fencing progresses. No permits of a permanent or semipermanent character will be issued, however. Timber cutting on the area will be subordinated to silvicultural experimentation.

General Forest News

Forest Insects in 1929

By F. C. CRAIGHEAD, United States Bureau of Entomology

(A report prepared for publication by the Insect Pest Survey)

The infestation of the western pine beetle (*Dendroctonus brevicornis* Lec.) in southeastern Oregon and northeastern California declined in 1929 by from 40 to 90 per cent. This infestation had been gradually building up for the past seven years and had reached a peak in 1928. Over rather extensive areas losses for this period ranged from 3 to 12 per cent of the stand; occasionally on more restricted areas from 25 to 50 per cent of the timber was destroyed, totaling in all many millions of feet. The remarkable decline in 1929 is attributed largely to increased growth of the trees during the 1928 season, made possible by the reserve of moisture built up by the heavy precipitation during the spring of 1927.

Numerous outbreaks of the mountain pine beetle (*Dendroctonus monticolae* Hopk.) again were reported in 1929 in California, Oregon, Idaho, Montana, and Wyoming. The infestation of great magnitude commented upon a year ago, involving the Bitterroot, Nezperce, Salmon, and Beaverhead National Forests, did not markedly change in 1929. This infestation, covering hundreds of square miles, continues to advance through the lodgepole areas of these forests and unless something unforeseen develops will eventually destroy practically all the merchantable timber on these areas. Strenuous efforts have been made by the Forest Service to keep this infestation from spreading southward and eastward into the great body of lodgepole pine in the Yellowstone National Park and surrounding national forests—the Gallatin, Madison, and Wyoming. Control operations were begun in many localities, and it is estimated that some 50,000 infested trees on these areas will be treated during the winter and spring of 1930. The infestation by this species in the Crater Lake National Park, Oreg., still presents a serious problem, and a few local outbreaks have been reported in the Sequoia National Park, Calif. The latter will be treated in 1930.

Infestations of the mountain pine beetle in western white pine were markedly on the increase in the

northern Rocky Mountain region during the past year. This is especially true of the Kootenai National Forest, Mont., and the Coeur d'Alene National Forest, Idaho. It has been recommended to the Forest Service that some 50,000 trees be treated on these areas. Infestations on the Kaniksu National Forest, Wash.-Idaho, and the Pend Oreille National Forest, Idaho, have reached such proportions following forest fires of the past two years that efforts to control them are deemed hopeless.

Only two outbreaks of the Black Hills beetle (*Dendroctonus ponderosae* Hopk.) were reported in 1929. One on the Colorado National Forest, Colo., involved about 500 trees composing marginal groups around the main infestation, which was put under control in the past two years. A few yellow pines were reported attacked on the Ashley National Forest, Utah.

Preliminary reports indicate that 1929 control work materially checked the vigorous outbreak of *Dendroctonus barberi* Hopk. on the Prescott National Forest, Ariz., against which the Forest Service had been working for the past two years.

The spruce budworm (*Cacacia fumiferana* Clem.) continued to be a serious pest in many regions. The lodgepole infestation involving 75 to 100 square miles in the southwestern portion of the Yellowstone National Park and the adjoining Targhee National Forest, Idaho, continued unabated, although in areas that had been infested for three years there was evidence that the number of insects had markedly diminished and that relatively few trees would be killed. Forest officers report reduction in numbers of this insect on the Idaho and Payette National Forests, Idaho, where it has been especially destructive to fir in the past few years. The outbreak centering along the Shoshone Canyon and east entrance to the Yellowstone continues unabated. Apparently a considerable percentage of the fir in this canyon will be killed. Other outbreaks in the Yellowstone have almost completely subsided. Some local feeding was found in the fir type of the Coeur d'Alene National Forest, Idaho, and the Colville National Forest, Wash. In the jack pine forests near Higgins Lake, Mich., this insect has continued active and has

done considerable damage, although no accurate estimates of abundance or injury are available. The outbreak in the vicinity of Itasca Park, Minn., has not caused much damage since 1925. In northeastern Minnesota fir and spruce trees are still dying as a result of an outbreak starting in 1918, but no defoliation has been observed the last two seasons.

The widespread killing of *Abies concolor* and *A. magnifica* by *Scolytus ventralis* Lec. in the Sierra and Cascade Mountains in California and Oregon showed little tendency toward reduction. The recent outbreak first attracted attention in 1924.

A rather startling local outbreak of an unknown sawfly has been reported on spruce in the vicinity of Old Faithful and The Thumb in the Yellowstone National Park.

The needle tyer (*Eulia* sp.), which destroyed so much lodgepole pine timber in the vicinity of West Yellowstone, Mont., has now almost completely disappeared.

During the past year our attention was called to serious injury to Douglas fir along the Gallatin River, Mont., thought at first to be caused by *Adelges cooleyi* Gillette. Examination showed that the *Adelges* was only a contributory cause, and the reason for the loss of foliage is at present obscure. There is some evidence that a spider mite infestation in 1928 was the chief cause. This mite is now injuring Douglas fir in several places in the Yellowstone Park region.

A local outbreak of *Dryocoetes confusus* Sw. in alpine fir was reported near Duck Lake, Yellowstone National Park, under conditions indicating that this species is actually a primary enemy of fir in this vicinity.

An outbreak of an undetermined moth (probably *Ellopiopsis* sp.) that defoliated great numbers of true fir and Douglas fir at Clouderoft, N. Mex., in 1928 was less destructive in 1929.

The parasite *Campoplex frustranae* Cushman has shown remarkable increase during the past three years in the pine plantations at Halsey, Nebr., into which it was introduced in 1926. At points of parasite introduction the tip moth infestation has been reduced during this period by from 33 to 92 per cent.

The hemlock budworm (*Peronea variana* Fern.) has defoliated western hemlock over an area of 150,000 acres on the Olympic peninsula of Washington. It is not thought that the trees will die unless heavy feeding on needles is continued in 1930.

* * * (Here Doctor Craighead noted the progress of the outbreaks of the fir tussock moth, discussed in this number of the Forest Worker by R. E. Balch.)

The southern pine beetle (*Dendroctonus frontalis* Zimm.) again was locally destructive during 1929. The outbreaks were in all cases associated with marked deficiency in precipitation, and in many cases group killings centered around lightning-struck pines. Local outbreaks have been reported throughout the Piedmont and Blue Ridge sections of Virginia, North Carolina, and South Carolina,

The range tent caterpillar (*Malacosoma fragilis* Streck. [?]), which in 1928 caused very extensive and widespread defoliation of bitter bush and other forage shrubs on the eastern slopes of the Cascade and Sierra Mountains, was markedly less abundant in 1929.

The boxwood leaf miner (*Monarthropalpus buxi* Lab.) is continuing its spread in the Southern Middle Atlantic States, being well established in Virginia now as far west as Leesburg.

The bagworm (*Thyridopteryx ephemeraeformis* Haw.) was exceptionally abundant in Washington, D. C., Virginia, and Maryland in 1929.

The birch leaf mining sawflies (*Fenusa pumila* Klug and *Phyllotoma nemorata* Fall.) were abundant in Vermont and New Hampshire on paper, gray, and yellow birch. The infestations in the north and in areas of considerable elevation remain the heaviest, although the insect occurs to some extent in Massachusetts.

The locust leaf miner (*Chalepus dorsalis* Thunb.) was conspicuous by its absence during the summer of 1929. So far as the experience of our own men goes, it did not appear anywhere in numbers sufficient to attract attention. It had been very abundant in the previous three or four years.

The larch case bearer (*Coleophora laricella* Hbn.) was reported locally abundant in parts of the southern peninsula of Michigan.

The larch sawfly (*Nematus erichsonii* Hartig) in the Lake States was much less abundant in 1929 and parasitism was high.

The pine scale (*Toumeyella numismaticum* Pett. and McD.) was exceptionally injurious locally in Minnesota on jack pine. In some places the trees were killed.

The jack pine sawfly (*Neodiprion banksianae* Rohrer) was reported to be much more abundant in the vicinity of Itasca Park, Minn., in 1929. In the seasons of 1928 and 1929 it was abundant and injurious in plantations near St. Paul, Minn.

Grasshoppers did considerable damage during the past summer on the Nebraska National Forest, Nebr. Supervisor Nelson reported that "in one 1928 planting 72 western yellow pines were healthy, 90 injured, and 1,038 killed, or 86.5 per cent loss due to this insect. It is estimated that 50 per cent of all losses in young plantations in 1929 may be attributed to this pest, which some old settlers say is the worst ever observed. We are unable at this time to suggest control measures. This condition will be given further study."

White pine weevil injury was more prevalent in 1929 over the entire northeastern area than in any other year, according to the records kept by the assistant entomologist stationed at the Northeastern Forest Experiment Station. It appears also that a greater number of trees were killed back more than two years by the weevil than has previously been the case. As in previous years, it was found that the greatest injury occurred in widely-spaced pure stands. The increase in infestation in mixed stands was scarcely noticeable.

On the White Mountain National Forest area, where the Bureau of Entomology has been conducting investigative work for several years, the bronze birch borer injury seemed to be more noticeable.

The pine bark aphid was particularly abundant in the summer of 1929. Many trees in natural stands and the older plantations were coated with the woolly substance from the ground well into the crowns.

White grubs have done great damage in many forest nurseries. Mortality as high as 50 per cent in transplant and seedling beds has been reported from some localities.

The pales weevil continued to do considerable damage to young pine stock on or close to areas from which the pines had been cut the previous winter.

The Fir Tussock Moth Reveals Ability to Cause Serious Damage

By R. E. BALCH, United States Bureau of Entomology

In 1929 a good deal of concern was caused by outbreaks on some of the western forests of an insect hitherto little known as a serious pest, the Douglas fir tussock moth (*Hemerocampa pseudotsuga*). These outbreaks have resulted in extensive defoliation of fir in several States, from Nevada to British Columbia.

The appearance of this moth in large numbers was first recorded at Chase, British Columbia, about 1918. In that instance the insect was thought to be a variety of the California tussock moth. In 1921 it was described as a new species by McDonnough. There are reports of damage in California some years ago that may have been due to this insect; but it was not definitely recognized in the United States until 1927, when it was reported defoliating alpine fir at Jarbidge, Nev., on the Humboldt National Forest. The following year it was noticed in one or two places on the Weiser and Boise National Forests, Idaho, and at the Craters of the Moon National Monument. Examinations made in 1929 showed that the whole of the Jarbidge Canyon was infested and that a serious attack had occurred on some 40 square miles of the Weiser and Idaho National Forests. At the same time a considerable epidemic had been developing in the neighborhood of Northport, in northeastern Washington, and south of the Grand Forks, British Columbia.

The small caterpillars of this moth commence feeding on the new foliage in the spring, but it is not until about the 1st of August that defoliation becomes severe enough to be noticeable at a distance. In the later stages the feeding is so heavy that rangers have described the damage as appearing overnight. By this time the larvæ are full grown. They are striking-looking hairy caterpillars easily distinguished by two long, black tufts of hair behind the head, suggesting horns, and a similar tuft at the posterior end. On the dorsal side of the first four abdominal segments are dense light-brown tufts, suggesting a toothbrush.

The body is gray or light brown, with numerous red spots.

Pupation commences early in August and a gray cocoon, made of silk mixed with larval hairs, may be found attached to the limbs and trunks of trees and often to the underbrush. These frequently collect in large masses, particularly beneath the bases of the limbs. Sometimes the cocoons are six or seven layers deep, so that the moths are unable to emerge from the lower ones. The moths appear in the latter part of August. The female is wingless, and has a large abdomen covered with a mat of dark-gray hairs. The male is winged and is of a dark grayish-brown color. The female lays her eggs in a mass on top of her own cocoon and covers them with a frothy gelatinous secretion in which are embedded the hairs from her body.

The fact that the females are wingless makes it difficult to explain just how an infestation spreads. When disturbed or in search of food the larvæ drop to the ground and travel rapidly—at a rate of about 1 foot per minute. It may be that they are transported on the backs of sheep or cattle and, when small, by the wind. It would not be expected that an infestation would spread rapidly by these means. The insect is widely distributed, however, and favorable conditions, probably in the main climatic, cause its outbreaks to develop simultaneously in widely separated districts.

At Jarbidge, alpine fir is the tree species attacked. On the Weiser Forest the most severe defoliation is found only where lowland white fir is prominent. On the latter forest the Douglas fir is almost as closely stripped as the lowland white fir, but has not been fed upon where the latter is absent. At Roby Creek, near Boise, the attack is on pure Douglas fir. In Washington and British Columbia Douglas fir is the preferred host and lowland white fir is attacked only when mixed with it. At one point on the Weiser Forest the underbrush, chiefly *Pachystima*, has been fed on apparently in preference to the fir.

All these epidemics seem to be about 3 years old. There is evidence, however, that they have reached their peak. Parasitism of larvæ and eggs is high and there has been heavy mortality among the larvæ apparently due to starvation and disease. Many of the trees are already dead, and those that survive will have their leaders killed and will become decayed.

Under present conditions artificial control is out of the question. Any method that destroyed the parasites would do more harm than good. Effective control might be possible, however, if an epidemic could be recognized before it became too large. This possibility is increased by the female's winglessness. A winter clearcutting of all trees, including reproduction, over the infested area is a possible method of starving the caterpillars. Burning the stand, crown and underbrush, would be more effective. In some places conditions would permit the use of arsenicals which,

applied in early summer, would poison the caterpillars without damaging the trees. In the present epidemic it seems best to rely on natural control. A control measure contemplated is the introduction of a large predacious beetle, *Calasoma sycophanta*, which has proved valuable as an enemy of the gypsy moth.

Studies Planned to Adapt Ground-poisoning Methods to Control of White Grubs

An effort is to be made by forest entomologists in the Northeast to adapt to the control of the white grub, which is very destructive to forest nursery stock, ground-poisoning methods that have been applied with success to the Japanese beetle at the Japanese Beetle Laboratory, Moorestown, N. J. In this work H. B. Peirson, State entomologist of Maine, and H. J. MacAloney, forest entomologist of the United States Bureau of Entomology, will cooperate with the members of the Northeastern Forest Experiment Station and with State foresters in the region.

Experiments at the Moorestown laboratory have shown that control of the Japanese beetle larvæ in the soil is effective upon application of 1,500 pounds of acid lead arsenate per acre, worked into the upper 3 inches of soil. Lead arsenate costs 14½ cents per pound. This treatment is effective 3 years and perhaps longer. Tests with different arsenic compounds indicated that acid lead arsenate is the most destructive to insects and the least harmful to vegetation. In general, the more soluble compounds have least value as insecticides and are most harmful to plants. On bog soils (pH 4.6) lead arsenate quickly caused death of all plants when applied in even such limited amounts as 100 pounds per acre. In synthetic soils of equal acidity prepared for growing azaleas, etc., this deleterious effect does not occur. Present indications are that when lead arsenic treatment is given commercial fertilizers must be avoided, otherwise the arsenic is rendered harmful to the plants. Any scheme for using arsenic as an insect-control medium should, of course, include safeguards against the poisoning of human beings.



In recognition of the poisonous effect of laurel cherry (*Prunus caroliniana* Ait.) on livestock the Eicher-Woodland Lumber Co., of Woodville, Wilkinson County, Miss., requires its felling crews to pile and burn all branches or tops of this tree that are dislodged in felling other species, Junior Forester H. G. Meginnis, of the Southern Forest Experiment Station, reports. Similar disposal methods have been used by public road construction crews in Wilkinson County.

United States Wood Imports in 1929 Valued at \$82,598,378

Imports of wood and wood manufactures into the United States were valued at \$82,598,378 in 1929, as compared with \$80,139,475 in 1928 and \$92,665,949 in 1927, the Department of Commerce reports. Lumber and logs, both softwood and hardwood, imported in 1929 totaled 1,815,091,000 feet, and were valued at \$53,294,966. Shingle imports decreased to 1,672,880,000 feet valued at \$6,850,073, which is about \$800,000 less than the 1928 valuation. Lath imports dropped 39 per cent in quantity and 44 per cent in value, to 786,767,000 feet valued at \$3,561,514. Furniture imports were valued at \$5,576,472 in 1929, representing more than one-half the value of wood manufactures imported. Pole imports increased to 971,676, valued at \$4,039,598, which is \$770,000 more than the 1928 valuation. Railroad ties imported increased to total 920,995, valued at \$735,758. Sawn and cleft pickets and palings were not quite up to the 1928 totals, the 1929 value standing at \$445,757.

Softwood lumber imports totaled 1,418,319,000 feet. The largest imports of softwood lumber from individual countries were as follows:

	1,000 feet
Austria.....	5,462
Finland.....	382
Germany.....	2,614
Poland and Danzig.....	1,121
Soviet Russia in Europe.....	37,936
United Kingdom.....	584
Yugoslavia and Albania.....	7,108
Canada and Newfoundland.....	1,351,914
Nicaragua.....	1,013
Mexico.....	9,126

Fire Protection on Fruit Growers Supply Co. Land

The many fires that have occurred on the lands of the Fruit Growers Supply Co. in California in the past four years have been controlled so quickly as to cause negligible damage, the Western Forestry and Conservation Association reports. The company has developed a modification of the European "fire lane and compartment" system. At a cost of about \$98,000, or \$4.90 an acre—much less than half the cost of piling and burning slash—the company has in four years constructed 122 miles of 100-foot fire lanes, fireproofed 27 miles of railroad and main highways, built 73 miles of special fire-protection roads, and felled all dead snags on 17,000 acres. Compartments average about 100 acres. Each edge of the cleared firebreaks is trenched with a specially constructed tractor plow. An intensive patrol and lookout organization is maintained.

National Lumber Manufacturers' Association Establishes Laboratory

The National Lumber Manufacturers' Association has established a lumber laboratory of its own at the Catholic University of America, located in the suburbs of Washington, D. C. For research in wood properties, handling, and utilization needed by its members in connection with the manufacture and marketing of lumber the association has heretofore depended entirely upon the Forest Products Laboratory of the United States Forest Service and other outside agencies. The work carried on at the new laboratory will be supplemental to that carried on through the cooperation of these outside agencies with the association. Recently the association's research interests have been intrusted to a research advisory committee, of which the chairman is C. Arthur Bruce, vice president of the E. L. Bruce Co., Memphis, Tenn. Administration of the committee is in the hands of Frank P. Cartwright, chief engineer of the association. J. E. Myer, a graduate of the New York State College of Forestry who has for several years been connected with the engineering department of the association as wood technologist, will have charge of the work of the new laboratory, under Mr. Cartwright's direction.

The first tests to be made in the new laboratory will have to do with fire-retardant treatments and abrasion resistance of woods.

Prize-Winning Devices for Preventing Waste in Lumber Manufacture

The two \$100 prizes offered by the National Lumber Manufacturers Association in its 1928-29 national waste-prevention contest were awarded to R. F. Buckley, edgerman and beltman employed by the J. J. Newman Lumber Co., Sumrall, Miss., and A. Bratlie, steam and electrical engineer for the Snoqualmie Falls Lumber Co., Snoqualmie Falls, Wash.

Mr. Buckley's device (previously described in the Forest Worker of September, 1928) is an edger safety guard that has demonstrated its value many times since its installation in the plant where he is employed. It consists in a set of fingers of high-grade steel suspended from and swinging on a shaft that is fastened to the top of the edger frame. The fingers hang down immediately behind the back feed roll. They are spaced about one-half inch apart by blocking so as to prevent binding. Unlike numerous similar devices that have previously been tried this safety guard, being located on the back of the edger, does not interfere with the operator's view of the machine. As the timber or board passes through the edger and under the back feed rolls it pushes the fingers up. They ride the timber until it leaves the edger, then drop back into position. The fingers next to the edgings keep them upright and away from the idle saws, but if for any

reason an edging topples over one or more of the fingers immediately drop down on it and hold it against the pull of the saw. The shaft from which the fingers are suspended is equipped with a coil spring which adjusts the fingers and prevents their pecking small boards that may follow cants through the edger.

This safety guard can be made up in any sawmill. To make and install it costs about \$30.

Mr. Bratlie's device is a carriage block cleaning attachment having for its object the reduction of operating costs. It can be attached to any carriage operated with air, steam, or electricity. It consists in a steel spring arm that swings over and just clears the carriage block. The arm is attached to the lower end of a bell crank rotating in a bearing on the end of a piston operated by an air cylinder. The cylinder is mounted on a swinging bracket, which is bolted to the side of a carriage knee. When a log is on the carriage this arm is recessed in the face of the knee so as not to form an obstruction on the knee. When the setter wishes to clean any bark, sawdust, or other debris off the carriage block he throws a valve that permits air to enter the cylinder, thus causing the piston to be pulled in the end of the cylinder and in turn swinging the arm across the block and wiping off all debris. The device is particularly useful on carriages equipped with electrical or air dogs, since the setter can clean the blocks without leaving his position at the set works. In any event it appreciably increases the quantity of work that can be done on a carriage. It also helps to produce more accurately sawed lumber, and can be used to kick off the last board left on the carriage.

The cost of this device, installed on carriages operated with air or steam, is approximately \$10 per knee. On electrical carriages the necessity of using a solenoid would increase the cost to approximately \$25 per knee.

Good Returns from Sale of Walnut Trees on Missouri Farm

Seventy walnut trees on the farm of W. P. Johnson, 5 miles southeast of Minden, Barton County, Mo., were recently sold to a St. Louis firm for \$1,500, the Lamar Democrat reports. The trees were second growth and were from 12 to 14 inches in diameter. The buyer was allowed to select 40 trees and Mr. Johnson himself designated the remaining 30. The buyer cut the trees and hauled them at his own expense; thus the \$21.50 per tree received by Mr. Johnson was net.

According to the international log rule these trees, averaging 13 inches in diameter and containing at least two 16-foot logs apiece, had an average volume of 130 board feet, and the total volume of the 70 trees was 9,100 board feet. Thus these comparatively small-sized trees, lacking the fine figure of the large old walnuts and containing a good deal more sapwood in proportion, brought in the handsome return of nearly \$165 per 1,000 board feet.

National Drainage Congress Recommends that States Encourage Reforestation

The nineteenth annual convention of the National Drainage, Conservation and Flood Control Congress, held in St. Louis February 20-22, in which 15 or more States and the Federal Government were represented, adopted the following as one of its resolutions:

Resolved, That we recognize the economic waste to the country of the rapidly increasing area of deforested lands, a great proportion of which lands are unsuited to other purposes than forest growth and must remain idle unless put to service in the reproduction of much-needed commercial timber; and we express our commendation of the progressive policy of the National Government in its encouragement of reforestation in the States of the Union; and we urgently recommend to the States the great importance in the public interest of the enactment of all such legislation, constitutional and statutory, calculated to provide necessary encouragement to constructive reforestation plans wherever the reproduction of the Nation's essential timber supply may be advanced. We recognize the possibilities of forestation as a factor in water conservation and stream regulation, and commend the investigations of the Government in this direction.



The northern white pine is native to the South Carolina counties of Oconee, Pickens, Greenville, and Spartanburg. H. W. Barre, director of the South Carolina Experiment Station, reports. Its natural range extends a very short distance along the Blue Ridge in these counties, next to the North Carolina line. A few specimens seem to be thriving very well on the campus of Clemson College, 30 miles from the foothills.

Young oak trees must have plenty of sunlight if they are to develop strong root systems, Prof. A. E. Holch, of the University of Nebraska, told the Ecological Society of America at its recent meeting in Des Moines. Professor Holch studied young bur oaks on an open hilltop, in an open stand of oaks, and in a more densely grown stand of linden. Year-old seedlings in the full light of the hilltop developed a root depth of 5 feet and a total spread of 2.25 feet. Trees of the same age in the 12 per cent light of the oak forest had a root depth of 1.6 feet and a spread of nine-tenths of a foot. In the shade of the lindens, where there was only a 3 to 4 per cent light, the roots reached a depth of only 11 inches and had a 3-inch spread.



A 150-acre tract of longleaf pine forest in Jasper County, Tex., was dedicated in October, 1929, as a Daughters of the American Revolution Forest by the Texas division of that organization. W. P. H. McFadden gave 100 acres of the tract and D. A. R. chapters throughout the State contributed funds for purchase of the additional acreage. Further purchases are planned. One of the purposes to which the area is dedicated is that of demonstrating reforestation. The area has been logged, but carries a good stand of small longleaf poles and reproduction, Director E. O. Siecke, of the Texas Forest Service, writes.



A group of north Florida business men have organized as the Forestry Associates (Inc.), and bought 40,000 acres of land which is to be placed under forestry management by the James D. Lacey Co.

Foreign Notes

Aircraft and Radio Protect Saskatchewan Forests

Ground patrol in connection with forest-protection work in Saskatchewan has now become largely stationary, aircraft and wireless having replaced the old tedious method of canoe patrol along winding rivers and across rough, windy lakes, writes E. H. Roberts in the Forestry Chronicle. Seaplanes, supplied and manned through cooperation of the Royal Canadian Air Force, have been used most effectively to carry out detection and supervision patrols and for suppression work. The aircraft have their main base in the south-central part of the territory, with a subbase in the north-central part. Six refueling stations are located at strategic points where fire rangers have headquarters and suppression crews and supplies are available. For

detection patrols in the late winter small light planes of the D. H. Moth type are used, equipped with skis for landing on ice. As the ice breaks up in the lakes this landing gear is replaced by floats.

In the spring when the waterways open up seaplanes are put into operation. A small flying boat that will carry 400 to 600 pounds is used for detection patrols and light suppression work in addition to the moth planes. Larger flying boats with twin motors and a carrying capacity of approximately 1,500 pounds are used for heavy suppression work. These planes are kept standing to at the base, fully equipped and in readiness to take the air on short notice.

Facilities for rapid communication in connection with fire-protection work are provided to the Dominion Forest Service by the Royal Canadian Corps of Signals. Wireless sending and receiving stations of

100-watt capacity operating on a wave length of about 1,100 meters have been installed at five different points in the district. The control station is located at the headquarters of the forest officer in charge of the territory; other stations are located at the main air base and at subbases in various parts of the district.

Detection aircraft equipped with wireless sending sets keep in touch with the bases and promptly report all fires observed, with details. When such a report is received by the district fire ranger he dispatches a suppression plane with men and equipment to the nearest point on a waterway from which a crew can operate. The plane returns at once to its base to be in readiness for further action. All fire rangers and fire-fighting crews are provided with two canvas panels, 20 feet long by 3 feet wide, which they use as ground signals for communicating with the pilots of planes in the air. Fire rangers and crew foremen are taken for flights over fire areas for reconnaissance. Fire maps may be sketched from the air and aerial photographs taken of burns, which are very helpful in preparing estimates of damage.

At the main air base and at each subbase and refueling point there is maintained a warehouse fully stocked with fire-fighting tools and equipment. At the fire rangers' headquarters are kept large freight canoes, equipped with outboard motors, which can be used also in transporting men short distances to fires if planes are not immediately available.

Airplane Dusting Proves Successful in Canada as Method of Controlling Hemlock Looper

Three operations carried out last year by the Canadian Government and cooperators in efforts to control the hemlock looper by distributing calcium arsenate from an airplane resulted very successfully, Associate Dominion Entomologist J. M. Swaine reports. In each case more than 90 per cent of the caterpillars present on the areas treated were destroyed.

All three operations were in eastern Canada. The first was carried out at Manicouagan, on the north shore of the Gulf of St. Lawrence, where the hemlock looper had been spreading rapidly in balsam fir stands for two years. This outbreak extended over an area of some 3 square miles adjoining the estuary of the Manicouagan River and had behind it a very extensive area of valuable pulpwood. Timber operators holding limits in the infested region cooperated with the provincial and Dominion governments in the work. Fifteen tons of calcium arsenate was shipped to Manicouagan and the area to be dusted was surveyed and marked for the guidance of the pilot. Dusting was begun on July 7 and was continued in all favorable weather during the second and fourth weeks of the month. The poison was applied in doses varying from

10 to 20 pounds per acre. Results indicated that for the younger stages of the caterpillar 10 pounds per acre would be an effective dose, and that for the older stages the maximum dose required would be 20 pounds per acre. Here, it is reported, certain natural factors were undoubtedly operating to reduce the number of the caterpillars, but the effect of the dusting was immediate and most convincing.

During the same period a dusting operation on a similar scale was conducted with similar results by the forest branch of Ontario and the Dominion division of forest insects for the control of a hemlock looper outbreak on hemlock over a large area about Lake Joseph, in the Muskoka region. A third such operation was carried out by forestry organizations in British Columbia in cooperation with the Dominion division of forest insects on a less widespread infestation of the hemlock looper affecting western hemlock.

For forest dusting operations under commercial conditions at a short distance from water or rail transportation, east of the Great Lakes, Doctor Swaine estimates the cost of the dust, landed at the base of operations, at approximately \$1.25 per acre; the cost of labor, food, and incidentals, at \$1 per acre; and the plane charge at about \$3.55 per acre, with variation according to location and conditions of the area. The total estimated cost of approximately \$6 per acre, or \$38.40 per square mile, he remarks, will be a profitable investment if the operation results in checking a small outbreak and prevents its extension over a large and valuable forest. Otherwise, the justifiability of the expenditure will depend on the value of the stand to be treated.

Insects like the spruce budworms, which feed much of the time within nestlike shelters in the foliage, are not so readily destroyed by poison dusting as insects such as the hemlock looper and the jack-pine sawfly, which feed in an exposed position on the foliage. A continuation in 1929 of dusting operations directed against a spruce budworm outbreak at Westree, west of Sudbury, Ontario, resulted in destruction of large numbers of the budworm caterpillars on areas receiving from 30 to 40 pounds of poison; but the mortality was not high enough to be considered a commercial control. The timber on the area treated had been injured by previous defoliation much more severely than had been detected in advance of the dusting operation, so that the caterpillars very quickly destroyed the little foliage on the exposed tips of the crowns and dropped to the lower branches, where they were largely protected by the surrounding hardwood foliage. It was believed that satisfactory mortality would probably have been obtained if engine and hopper trouble had not delayed the application for several days.

In these operations use was made of a trimotor plane, mounted on floats, capable of carrying nearly a ton of dust.

A Successful Norwegian Forest Insurance Project

The successful operations of the Norwegian Mutual Insurance Company for Forest Fires have enabled the company to create through transfer of surplus a special fund which will provide extended insurance upon property that has been insured 25 years, Trade Commissioner Gudrun Carlson, Oslo, reports to the Department of Commerce. The 11,200 members of the company now carry insurance amounting to 377,824,596 crowns (Norwegian crown=\$0.268). The company now contemplates developing a system of single premium insurance, the demand for which is increasing in Norway. The inauguration of these plans has been made possible by cooperatively developed fire-prevention measures, particularly the maintenance of lookout towers throughout the forested area. The insurance company itself has made substantial contributions toward the construction of towers.

Caterpillars and Microsphaera Collaborate Against the Oaks

A theory of collaboration between caterpillar and microsphaera in explanation of the dying of numerous oaks in the forests of Yugoslavia is offered by Auguste Langhoffer, of the University of Zagreb, in the November, 1929, *Revue des Eaux et Forêts*. The caterpillars mentioned are *Lymantria dispar* L., *Euproctis chrysorrhoea* L., *Malacosoma neustria* L., and *Thaumetopoea processionea* L. The microsphaera are *Microsphaera alphitoides* Griff and Maubl. Great losses of oaks were recorded in the periods 1909-1912, 1915-1918, and 1920-1928. The oaks died only where the caterpillar attacks took place and always it was the oak attacked by caterpillars that died. Before 1909 the oaks were attacked by caterpillars which stripped them of leaves, but the trees did not die. New leaves came out and no evil effects were evident. But when the microsphaera came on the scene the oaks died en masse. The caterpillars got the first leaves of the season, the microsphaera got the second crop that came out about the beginning of June. The summer heat helped the destruction, for the second leaves are small and have little resisting power. They dry up and fall one by one. Following this the oak, unable to put out a third crop of leaves, usually dies. Some trees are especially hardy and resist until the second year.

The microsphaera may attack the first leaves, but without killing the tree. Early in the season the temperature is not favorable to the microsphaera and the tree is able to withstand the attack. When humidity is not considerable, also, the microsphaera does not develop and attack the second leaves in a dangerous way. In 1927 the very hot and dry summer held back the development of the microsphaera until the leaves were advanced enough to resist attack.

Many an oak that would have survived the collaboration of these two enemies falls a victim to a third enemy that finds it enfeebled by their attacks. Species of *Agrilus biguttatus* Fabr., *Platypus cylindrus* Fabr., *Xyleborus monographus* Fabr., *Gasterocercus depressirostris* Fabr., and others, including mushrooms like *Armillaria mellea*, are named in this list.

Remedies suggested are birds that eat the caterpillars, parasites, destruction of egg masses, and arsenic powder distributed by airplane.

New Quarters for the Forest Research Institute of India

The new plant of the Forest Research Institute of India was opened at Dehra Dun, India, on November 7. The main building and nearly all the subsidiary buildings and residences had been completed by that date, trees and shrubs had been planted, and grassy lawns and terraces had been developed. The plant includes six museums having a floor space of 26,000 square feet, and laboratories and offices covering about 63,000 square feet. There is a library finished in Andamans padauk, a large hall in Burma teak, and an entrance hall in shisham and rosewood. The office of the forest economist is panelled in poon (*Calophyllum*) from Madras. Burma teak has been used throughout the other rooms. A special feature has been made of the windows, with good lighting for laboratory work, the Indian Forester reports. The students of the Indian Forest Service College, who must now leave Chand Bagh, will be given lecture rooms in the upper floor of the west wing. The whole estate covers 1,200 acres, but 130 acres of this has been assigned to the railway board for a training college, and 6 acres has been leased to a company that will provide electric current to the new buildings. A considerable part of the grounds is taken up by experimental plantations of chir pine, sal, and teak, and by the experimental gardens of the silviculturist, the botanist, and the officer in charge of minor products.

Dehra Dun has been a center for forest work since 1878, when a college was established there for training rangers and foresters. Research officers were first appointed in 1906, since which time these officers have taken an important part in training the students. The aim of the research has always been to work on lines that will prove advantageous not only to the forest departments of all the provinces of India but also to all users of forest products, especially the railways and other large consumers of timber. Expansion of work and increase of staff have been steady during the last 23 years. In the branch of forest economy, which deals with the utilization of forest products, growth has been remarkable. The institute now employs 35 gazetted officers, 220 assistants and subordinates, and 350 day laborers, and its annual expenditure is more than 7 lakhs of rupees.

The work of the institute is divided under five heads—silviculture, forest economy or utilization, forest entomology, forest botany, and chemistry.

Since 1906 the institute has issued about 220 publications presenting the results of its work, as well as a large number of educational and other works.

The building erected for the institute in 1914 at Chand Bagh is now to be given up to medical research.



Between 3,000 and 4,000 acres of forest plantations were established by the Irish Free State Government in the year ending September 30, 1929, according to a statement in the Timber Trades Journal, London. The planting took place principally in Wicklow, Waterford, and Tipperary. About 10,000,000 trees suitable for planting are produced by the Government nurseries each year. About 80 per cent of this stock is of softwood species; the remainder is beech, ash, and elm.



The Riding Mountain Forest Reserve, in western Manitoba, has been made a national park. The newly established park includes 1,148 square miles of rolling woodland. Park headquarters will be at Clear Lake.

The British Empire Marketing Board has approved a capital grant not exceeding £30,000 to be devoted to research on Empire timbers at the Forest Products Research Laboratory, Princes Risborough, Bucks, England. This grant, the Empire Forestry Journal reports, arises out of a recommendation made by the Imperial Economic Committee in its report on Timber. The committee suggested that the marketing of Empire timbers might be considerably furthered if the Princes Risborough station could be enlarged so as to include the testing of woods from the dominions and colonies as part of its normal routine.



The 1,878 meetings held in 1929 by traveling lecturers of the Canadian Forestry Association had an attendance of 475,742. The lecturers' mileage was 70,014. For 1929 the association reports a membership of 32,008.



During 1929 extreme drought conditions prevailed throughout western Canada. The area burned over was 6,029,749 acres, of which approximately two-thirds was nonforested. Suppression costs reached the unprecedented total of \$978,000.

Personals

Williard R. B. Hine has accepted appointment as executive secretary of the Society of American Foresters, effective April 1. His headquarters will be in Washington, D. C. Mr. Hine received the B. S. degree in 1920 and the M. F. degree in 1921, both from Cornell University, and was appointed in the latter year to a position at the Southern Forest Experiment Station. Leaving the station in 1925, he became State forester of Louisiana. He left this position in October, 1929, to accept appointment with the United States Forest Service as senior district forest inspector in charge of Federal cooperation under the Clarke-McNary law in the Gulf States.

H. H. York, for several years supervisor of forest investigations, division of lands and forests, New York Conservation Department, has resigned to accept the chair of forest pathology, University of Pennsylvania.

John D. Rue, recently director of research of the Champion Fibre Co., Canton, N. C., is now connected with the Newsprint Service Bureau.

Floyd V. Horton, inspector in the office of range management in the Portland, Oreg., district office of the United States Forest Service has been promoted to the position of assistant district forester in charge of lands.

Samuel J. Record, head of the tropical department in the Yale School of Forestry, has been chosen a member of the standing committee on forest resources appointed at the Fourth Pacific Science Congress, held in Java in 1929. The function of the committee is to collect information as to the forest resources of the countries around and in the Pacific.

Ward Shepard has resigned as assistant chief of the branch of public relations, United States Forest Service, in charge of information, to become associated with Gifford Pinchot in work having to do with forest conservation. Mr. Shepard entered the Forest Service in 1913 immediately after graduation from the Harvard Forest School. After holding several positions in the Southwestern National Forest District he was brought to Washington in 1921 as assistant chief of the branch of research. He transferred to the branch of public relations in 1926.

Henry B. Steer will soon join the United States Forest Service as senior forest economist in charge of stumpage-price and lumber-price projects. Mr. Steer is a graduate of Cornell University with the B. S. and M. F. degrees, and has had 11 years' experience with the Indian Service. At present he is in charge of all timber work on the Quinault Reservation.

Carlyn C. Delavan, professor of forestry at the New York State Ranger School since 1923, has been transferred to the extension department of the New York State College of Forestry. He succeeds G. H. Lentz in extension work and also as director of the summer camp of the college. Professor Delavan is a forestry graduate of the University of Michigan, and before entering the educational field had experience in the United States Forest Service and in the State forestry organization of Vermont.

A. C. Shaw, supervisor of the Choctawhatchee and Ocala National Forests, Fla., on May 1 succeeds the late R. H. Charlton as supervisor of the Ouachita National Forest, Ark. S. R. Broadbent, supervisor of the Unaka National Forest, Tenn., succeeds Mr. Shaw, and C. I. Graham, assistant supervisor of the Pisgah National Forest, N. C., succeeds Mr. Broadbent. Junior Forester John Byrne transfers from the Nantahala National Forest, N. C., to the Pisgah Forest as assistant supervisor, and District Ranger John H. Stone of the Allegheny National Forest, Pa., succeeds Mr. Byrne.

Charles E. Randall has been promoted to the position of senior editor, branch of public relations, United States Forest Service. Mr. Randall, who is a graduate of Leland Stanford University, entered the Forest Service early in 1927 after several years' experience in blister-rust control work and in newspaper work. His work in the Service heretofore has been the preparation of press material and arrangement of forestry programs for radio use.

Jack B. Haile, superintendent of road construction in the Eastern National Forest District, has been transferred to the Washington office of the United States Forest Service as associate engineer.

R. W. Shields, for two years supervisor of the Shenandoah National Forest, Va., has been transferred to Washington, D. C., as assistant to the chief of operation, Eastern National Forest District. Since 1911 Mr. Shields has had a part in national forest acquisition and development in the East. He is succeeded by John W. McNair, assistant supervisor of the Cherokee National Forest, Tenn. Mr. McNair entered the Forest Service in 1919 as a ranger on the Natural Bridge National Forest, and for nearly five years was assistant supervisor of the Pisgah National Forest. Ernest J. Schlatter, junior forester on the Deschutes National Forest, Oreg., is being transferred to the Cherokee Forest as assistant supervisor.

C. E. Farnsworth, jr., a 1928 graduate of the Yale Forest School employed until recently as technical assistant on the Targhee National Forest, Idaho, has accepted the position of instructor in forestry at the New York State Ranger School, Wanakena, N. Y., effective March 15, 1930.

J. A. Evans, assistant chief of the Office of Cooperative Extension Work, United States Department of Agriculture, has been made associate chief of that office. He is succeeded by T. Weed Harvey, formerly assistant to the chief.

Ralph W. Hussey, associate range inspector in the Southwestern National Forest District, has been appointed supervisor of the Apache National Forest, Ariz.

A. J. Streinz, timber sales assistant on the Ouachita National Forest, Ark., has resigned to accept a position as assistant professor of forestry at the University of Louisiana.

W. H. Monsson, chemist on the pulp and paper staff at the United States Forest Products Laboratory, left the laboratory March 20 to accept a position with the Munising Paper Co., Munising, Mich. Mr. Monsson, who is a graduate of the University of Illinois, accepted appointment to the laboratory staff in 1923. He received the M. S. degree from the University of Wisconsin in 1925. His experience at the laboratory has been mainly in sulphite pulping research.

Clarence Hill Burrage has resigned as forester for the University of Kentucky and is now connected with the Virginia Conservation and Development Commission. His new work has to do with the purchase of land for the proposed Shenandoah National Park.

J. Oscar Blew, jr., has joined the faculty of the New York State College of Forestry, succeeding George P. Kramer as instructor in timber preservation. Mr. Blew was graduated at this college in 1927, and since then has had experience in industrial timber preservation.

Ellwood Wilson, manager of the forestry division of the Canada Power & Paper Co., Grand'Mere, Quebec, has been elected president of the Canadian Forestry Association.

P. Z. Caverhill, of the British Columbia Forest Branch, is president of the Canadian Society of Forest Engineers for 1930.

Carl L. Hubbs, curator of fishes of the University of Michigan Museum, has been named to direct the scientific investigations of the fish division of the Michigan Department of Conservation.

James D. Kennedy has resigned as assistant professor of forest extension, New York State College of Forestry, to accept a position as district forester for the New York Conservation Commission, with headquarters at Auburn, N. Y. Mr. Kennedy is a member of the 1923 forestry class of Purdue University. He was previously connected with the blister-rust control work of the New York Conservation Commission.

Harry E. Dobbins has resigned as junior forester, United States Forest Service, to accept a position as district forester of the New York Conservation Commission, with headquarters at Salamanca, N. Y. Mr. Dobbins had forestry training at the University of Wisconsin and the University of Michigan.

Leon J. Cranston, for the past five years in charge of the San Jacinto district of the San Bernardino National Forest, Calif., has been promoted to the position of assistant forest supervisor. He will have charge of the improvement program on the San Bernardino.

Bibliography

A Bulletin on Forest Nursery and Planting Experiments in California

By C. R. TILLOTSON, United States Forest Service

"Forest Nursery and Planting Practice in the California Pine Region" does not exactly indicate the scope of the bulletin¹ by S. B. Show recently published by the United States Forest Service under that title. The bulletin does not take up the mechanics of nursery work or the methods and practices of large-scale planting operations. It does present a rather clear picture of the difficulties attending forest planting in California, such as the brush cover, the scantiness and poor distribution of rainfall, the lack of moisture in the soil during summer, and the high rate of evaporation. The bulk of the discussion, however, is devoted to experimental results achieved in two nurseries with western yellow pine, sugar pine, Jeffrey pine, incense cedar, Douglas fir, and white fir. The experiments were directed toward developing a technique, both in nursery operations and in field planting, that would insure reasonable success in efforts to reforest California brush fields. They gave a partial indication also of the degree of success possible in reforesting these lands. The bulletin will have immediate interest for persons or organizations contemplating forest planting in the California pine region.

Admitting that his data are in some cases insufficient for definite conclusions, where his results seem to justify it the author does draw such conclusions in respect to various features of nursery practice and field planting. For instance, he states definitely that better plants of western yellow pine and Jeffrey pine are produced from spring-sown than from fall-sown seed, while sugar pine, white fir, and incense cedar develop satisfactorily only from fall-sown seed; that drill sowing and broadcast sowing seem to give essentially the same results; that burlap mulch is in general superior to a mulch of pine needles; that western yellow pine, Jeffrey pine, and incense cedar are produced as well under no shade as under shade, and the pines especially develop a great deal better when shade is not applied.

Sugar pine, Douglas fir, and white fir, on the other hand, experience heavy losses if unshaded and do better even in the transplant beds if shade is supplied. Abundant watering, particularly in seed beds, is proved to be essential, particularly for the growing of thrifty, properly developed stock. In respect to field planting, the author concludes that for most planting areas seedling stock gives too uncertain results; 1-1 stock is best for ordinary use, and 1-1-1 stock for very unfavorable sites. In brush-field planting, survival percentages are shown to increase with increase in the degree of shade the plants receive, and better results are obtained by planting in the early spring as soon as the snow leaves the ground than by fall planting.

The publication is not only an excellent guide for the nurseryman or planter in California; it is a clear demonstration of the practical value of the information that well planned and executed experiments can bring out. It contains many helpful suggestions for nurserymen and planters of other regions as to how they may grapple with their own nursery and planting problems and improve their own technique.

A Study of 30-Year-Old Forest Plantations

Under the title "Forest Plantations at Biltmore, N. C.," the Forest Service has recently published the results of a general study made in 1921-22 of plantations established on the Biltmore estate, near Asheville, N. C., from 1890 to about 1911. The study was made by the Appalachian Forest Experiment Station. Interest attaches to this study not only because of the age and extent of the plantations but because of the large number of species used. In summarizing his conclusions from the study Ferdinand W. Haasis, author of the report, attributes the unsatisfactory results obtained from many hardwood plantings on the estate to the fact that between the time when the land sustained a stand of native hardwoods and the time when plantings were made soil conditions had changed as a result of the farming of the land and its subsequent abandonment. A second obstacle to satisfactory results with hardwoods has been the action of rodents, both in eating seed and in attacking seedlings. The suitability of northern white pine for

¹ United States Department of Agriculture Circular No. 92. For sale by the Superintendent of Documents, Washington, D. C., at 15 cents a copy.

planting in the region has been clearly demonstrated, as has the desirability of planting the native yellow pines in mixed stands. Of the hardwoods that have survived sugar maple is the best and oaks are second. Oak as an understory of pine can evidently be counted upon to persist and to step readily into the place of the pines when these are removed. Of the exotic species tried at Biltmore, Norway spruce has given the best results. The plantations afford convincing evidence of the silvicultural value of thinnings where trees have been closely spaced.

Copies of this publication can be obtained free of charge, while the supply lasts, from the Office of Information, United States Department of Agriculture, Washington, D. C.

Tractor Logging Costs in the California Pine Region

By J. A. FITZWATER, United States Forest Service

In Bulletin 474² of the Agricultural Experiment Station, University of California, Associate Professor of Forestry M. E. Krueger has analyzed data on factors affecting the cost of tractor logging in the California pine region which he obtained by observations on five different logging operations. Mr. Krueger's studies show clearly the degree to which the cost of yarding in caterpillar tractor logging is affected by the factors of stand per acre, number of logs per thousand board feet, length of haul, slope, and soil. The operations studied were uniform as to the specific types of equipment used; where equipment not of the same specific types but of the same general type and power is used, Mr. Krueger points out, costs should not differ materially from those indicated by his analysis.

Mr. Krueger emphasizes the fact that no other development of recent years has been so readily applicable to selective logging as has tractor yarding. His studies (two of which were conducted on national forest operations) convinced him that good forestry practice in tractor logging can be obtained by observing the two simple regulations of holding tractor travel to well-defined skidding trails and turn-out places and avoidance of choking two logs at ends adjacent to the same cut; also that if operators are determined to carry on good forestry practice in the woods they can, through good organization, largely eliminate the damage attending tractor logging, with but little additional cost.

Mr. Krueger summarizes the results of his studies as follows:

Other factors being equal, small-diameter logs cost considerably more to yard by ground skidding than do large-diameter logs, owing to the difficulty of maintaining a high average load per trip. This can be

somewhat offset by logging in long dimensions or by hauling a larger number of logs per trip.

It is economy to leave small-diameter trees standing.

Size of load is the biggest factor affecting the cost of yarding because the increase in the total trip time is nowhere proportionate to the increase in the size of the load. The size of the load is basic to the factors of log size, slope, and surface conditions.

Slope produces a greater effect on the cost of ground skidding than on wheel yarding. Increase of adverse slopes materially decreases the load per trip and therefore increases the cost per thousand board feet for both methods of yarding. Favorable slopes of 10 per cent to 30 per cent are ideal for skidding, with the practical maximum at 50 per cent.

The larger possibility of excessive yarding cost comes from yarding short of the economic maximum distance rather than beyond it.

Bunching cost is a very large factor of yarding cost in the use of Robinson big wheels. The cost of bunching is practically in direct proportion to the number of pieces handled per bunch.

The main requisite for successful tractor logging is proper organization. The very important item of maintaining a high average load per trip is largely a matter of proper supervision, and proper balance of equipment is the result of careful planning.

This bulletin should prove very helpful to operators who are using or who contemplate using caterpillar tractors for yarding purposes. In many cases the tables themselves will be directly applicable; the big value of the study, however, lies in the fact that it provides operators in general with a basis for analyzing their own particular problems.

Our Federal Lands

By L. F. KNEIPP, United States Forest Service

In a volume entitled "Our Federal Lands,"³ the subtitle of which is "A Romance of American Development," Robert Sterling Yard has brought out quite successfully, in a popular and entertaining way, the historical and romantic highlights of the Federal Government's land policy. The reader may note an occasional statement or figure that does not square with his own knowledge or understanding, or a conclusion with which he can not agree; this possibility notwithstanding, one can gain from the book a fresh and broad idea of the trend and sweep of the public land movement and the several epochal stages by which it has advanced.

Beginning with a background of general discussion of our national estate, its origin and extent, Mr. Yard passes to the consideration of the public domain, national forests, reclamation, water power, Indians, national parks, national monuments, and wild-life resources, concluding with a summary of progress resulting from a half century of nature conservation. In the process he expresses the point of view and the reactions of the average citizen who is interested in such subjects.

² Krueger, M. E.: Factors Affecting the Cost of Tractor Logging in the California Pine Region. 44 pp. illus. University of California Printing Office, Berkeley, 1929.

³ Charles Scribner's Sons, New York, 1928.

Research Casts Doubt on Fertilizing Value of Nile Silt

By C. L. FORSLING, United States Forest Service

The old belief that the silt brought down by summer floods of the Nile maintains the fertility of the soil in the rich agricultural valley of that river has undoubtedly led many people in this country to consider that the silt burden of any stream is good for something. Some irrigationists have even gone so far as to say that the silt added by irrigation water helps maintain the soil fertility of farmed land. A noteworthy example of the opposite effect is, of course, the Imperial Valley in California, where the farmers have learned through costly experience that the silt of the Colorado River not only is not to be desired, but must be disposed of so far as possible before it reaches the land.

But now comes E. M. McKenzie Taylor, of the school of agriculture, University of Cambridge, England, casting doubt upon that long-entertained supposition regarding the silt of the Nile. Writing in the June 20, 1929, issue of the *Engineering News-Record*, he states that the Nile silt has not the fertilizing value previously attributed to it. In irrigated as in nonirrigated areas, he says, the maintenance of soil fertility depends upon agricultural practices.

This conclusion is based on experiments involving the deposition of silt in growing cotton over a 3-year period. The results indicated that summer fallow is the effective agent in the maintenance of soil fertility under perennial irrigation in the Nile Valley. The value of silt as a fertilizer should not, of course, be confused with its value as a soil former.

There remains the argument in favor of silty streams for irrigation, upheld particularly by irrigation farmers in the districts of limited water supply in Utah, that silt-laden water can be made to cover more land than clear water. This is of no small importance in places where the water supply is very scanty and where the water that percolates through the soil can not be recovered by drainage or pumping—provided, of course, the deposition of silt does not result in too great a sealing up of the soil or in the addition of enough raw soil to lower the fertility of the land. In at least one district in Utah water users are complaining that the checking of erosion through revegetation of national forest watersheds has cut down the silt in the streams and thus reduced the acreage the water will cover. Run-off experiments recently carried out by the California Forest Experiment Station have demonstrated that the greater coverage by silty water is due to the sealing up by the silt of the pore spaces between soil particles.

The old theory in regard to the value of the Nile River silt, Doctor Taylor remarks, does not appear to have been questioned previously. Apparently it had been accepted as true simply on the basis that it had been repeated "from the time of the Pharaohs." All modern irrigation works in Egypt until recently were designed to carry the silt to the land, even though

great expense was involved in keeping the canals clear enough for the water to get through. If the findings in respect to the lack of fertilizing value of the silt are verified by further tests, less expensive irrigation systems in which the water is desilted before entering the canals may be employed.

A Russian Authority Reports on Work in Tree Breeding

By PERKINS COVILLE, United States Forest Service

In a Russian reprint with English summary recently received from the author A. Kolesnikov, professor of forest tree breeding at the agricultural college at Charkow, Ukraine, Union of Socialist Soviet Republics, discusses the subject "The Inbreeding of Forest Trees and its Meaning in Forest Genetics and Selection."

A great drawback of tree breeding as distinct from selection or vegetative propagation is the length of time that ordinarily must pass after the first pollination before the F_1 generation (the offspring of the first cross) bears flowers that furnish the basis for breeding the F_2 generation. Kolesnikov suggests as a means of forcing early maturity of the reproductive organs of young F_1 seedlings that F_1 seedlings be grafted into the crowns of older trees. In order to have good pollen of *Quercus robur* from various localities conveniently at hand for a study of its properties, for collection, and for use, Kolesnikov tried out successfully a procedure that is practically a reversal of that suggested for hastening maturity of the F_1 generation: "we grafted branches with blossom buds in their winter state to oak seedlings and to the seedlings of other leaf trees at the age of 1-2 years. In this way we succeeded in producing at the desired date tall flowering trees giving an abundant quantity of pollen of great vital capacity."

Kolesnikov also reports successful vegetative reproduction (by means of green cuttings) of *Quercus robur*, *Fraxinus excelsior*, *Juglans regia*, *J. cinerea*, *J. nigra*, and other species.

It is Kolesnikov's theory that no less success should attend the inbreeding (pure lines) and selection of forest trees than has attended the inbreeding and selection of agricultural plants. He has tested this by inbreeding *Quercus robur*, *Betula verrucosa*, *Ulmus campestris*, *Ulmus effusa*, and *Pinus sylvestris*, and reports that no degeneration, as judged by "germinative power" of the seed and vigor of the seedlings at one year of age was apparent except in the case of *Pinus sylvestris*, which had "an insignificant quantity of fertilized seed."

Referring to basic studies needed for a better understanding of tree breeding, Kolesnikov writes: "Then a detailed study of the structure of the flower organs, of the fertilization processes, and of the development of the ovary and seeds would be of great importance. The study of the pollen, its storage, transporting, and tests of germinative power before using should follow, being of essential interest for hybridization purposes."

Races of Oak and Their Breeding

By W. N. SPARHAWK, United States Forest Service

In common with many other species of trees the European oak (*Quercus robur*) has distinct physiological forms characterized by early and by late leafing and flowering. These characteristics are hereditary, but may be obscured by crossing. According to A. Kolesnikov,⁴ these physiological forms do not appear to be correlated with the common morphological differences in leaves, fruit, and buds, but do correspond more or less with differences in technical properties of wood, bark, etc. The late variety has wood of superior quality and resists frosts, insects, and fungi better than the early variety. The late variety also has a straighter bole, with fewer large branches, and grows faster in the juvenile stages. Planting stock of this variety can be obtained by gathering acorns from fairly isolated stands from which all individuals of the early form have been removed, and by carefully culling out from the nursery beds any seedlings of the early form.

The author remarks that foresters have not paid sufficient attention to the differences in races of oak and other trees, owing to their ignorance of the principles of plant selection and breeding. He makes the suggestion, which may be of interest to American forest schools, that a course in the fundamentals of forest genetics and selection should be introduced into the curricula of all the higher forest schools.

Denudation of the Punjab Hills

By F. H. EYRE, United States Forest Service

The forests of the Punjab (northwestern India) have undergone and are still undergoing serious deterioration in quality and extent. Moreover, erosion has progressed to a point at which the future productivity of the land is greatly endangered in many places and in others is actually destroyed. In many respects the situation is analogous to that found in parts of the United States. Consequently a description such as is given in a recent volume⁵ of Indian Forest Records by B. O. Coventry, conservator of forests, Punjab, should be of especial interest to American foresters.

The author treats his descriptive material from an ecological point of view. In the drainage basin of the Indus where the Punjab is situated, topography and climate vary enormously. From only a few hundred feet on the southern plains, elevations increase to more than 20,000 feet in the Himalayas. Average annual rainfall ranges from 5 to 30 inches on the plains and from about 50 to 100 inches on the higher hills.

The forests may be divided into several altitudinal climatic zones. "In the subtropical zone the climax formations of olive [*Olea cuspidata*] forests and other mesophytic types are changing to brushwood forests of *sanatha*." Widespread erosion has removed the top soil so that the valuable species which need this humus soil for regeneration have largely disappeared.

"In the subtemperate zone the mesophytic and climax formations of oak [*Quercus incana*] are changing to chir pine [*Pinus longifolia*], and the chir pine forests are generally deteriorating in quality." Chir pine forests are usually burned periodically to rid the soil of pine needle litter and thus make room for grass. Erosion has followed. Chir pine, being thick barked, has been able to stand the fires, and it continues to regenerate itself on mineral soil exposed by fires. But each fire is followed by considerable erosion of the surface soil, and as a result the chir pine forests have deteriorated considerably in quality. In places all the soil is gone and the chir pine remains to grow only in rock crevices.

"In the temperate zone climax formations of oak or other broad-leaved species are changing to blue pine [*Pinus excelsa*]. In other words there is a general tendency for the climax and mesophytic types to change to more xerophytic types, indicating a general change from moist to drier soil conditions * * *.

"The deterioration and retrogressive changes in the vegetation * * * are generally traceable to change in the soil due to erosion * * *.

"For the purpose of clearing lands for cultivation, providing grazing grounds with ample supplies of fodder, and protecting cattle against wild animals, wholesale destruction of the vegetation by means of fire has taken place in the past. In fact man has destroyed the forest vegetation wherever it has been possible to do so by means of fire, and the forests which are still in existence on the hills at the present day are simply the residue which man has not been able to destroy by fire owing to the dampness of the locality, or to the forests being of a noninflammable type, or consisting of species immune against extermination by fires * * *.

"From time immemorial it has been the custom of the people on the hills to feed their cattle by sending them out to graze at random over the hillsides without any restraint or attempt to regulate the grazing whatsoever." The recognition of grazing "rights" of long standing has resulted in overgrazing and erosion.

Need for forest conservation was recognized in the Punjab as early as 1855. About 1870 the Government forest department was organized. Rules drawn up soon after the passing of the Indian forest act defined what areas were to be taken up as Government forests and defined the "rights" that were to be admitted in the forests. On forest lands aside from the

⁴ The Races of Oak and their Breeding, in Russian with German summary. Charkiw, 1928.

⁵ Denudation of the Punjab Hills. 31 pp. illus. Indian Forest Record, vol. 14, pt. 2. Calcutta, 1929.

comparatively small proportion included in reserved forests unrestricted grazing was permitted, although restrictions were made over certain areas with regard to the cutting of trees. Liberal recognition was given to grazing "rights."

The remedial measures suggested by Coventry are in some respects alien to the American point of view. Organized pasture management is regarded as the only solution. It is proposed that certain areas be denuded of trees and handled as pastures pure and simple. Grass would hold the soil and with the removal of the competing forest cover the incentive to burn would be largely eliminated. Other areas would probably need to be handled for the production of grass crops which would be cut after seed had fallen. The expectation is expressed that the rural people will not take any initiative in protecting their common lands against denudation and that it may be generally necessary in the first instance for the Government to undertake the control of these lands. In the case of some villages, it is suggested, the difficulty could be most satisfactorily overcome by dividing the common pasture lands into private properties, each household being given a sufficient area for growing grass crops for the maintenance of its cattle.

Twelve-Year Results with Wyoming Shelter-Belt Planting

Results from shelter-belt plantings made at the Sheridan Field Station, Sheridan, Wyo., in the period 1917-1928 are reported by the University of Wyoming Agricultural Experiment Station in its bulletin no. 163.⁶ The station is located on a nonirrigated tract about 8 miles northeast of Sheridan. Most of the land used for shelter-belt plantings is on a northeast slope, the soil consisting in a dark, heavy clay loam with a small quantity of gumbo. The rainfall as recorded at the station shows wide fluctuations both in quantity and in distribution during the season, a condition characteristic of the Great Plains. The average annual rainfall for the 10-year period 1917-1926 was 15.10 inches, with a range from 8.56 inches in 1919 to 25.18 inches in 1923. Temperatures as high as 100° F. in summer and as low as -30° F. in winter occur, but seldom during any season and in many years not at all. Periods of warm weather, with day temperatures above freezing, are frequent during the winter. The wind velocity is relatively low compared with that in other sections of the Great Plains. Strong drying winds sometimes occur, but are relatively infrequent.

The plantings were made in cooperation with the Northern Great Plains Field Station of the United

States Department of Agriculture, at Mandan, N. Dak. Seedling trees were supplied by that station and the plantings were made according to plans furnished by it. The plantings were made on land that was in summer fallow the year before planting and in some cases for a longer period. Clean cultivation has been practiced since the shelter belts were planted.

A strip of ground 80 feet wide and 1,000 feet long on the west side of the station grounds and immediately west of the buildings was planted in 1917 in two equal blocks. In block 1 the trees were planted 4 feet apart each way. Nineteen rows, succeeding each other from west to east, were planted with the following species; Golden willow, golden willow, boxelder, green ash, poplar, boxelder, American elm, boxelder, green ash, poplar, boxelder, poplar cuttings, Chinese elm, green ash, poplar cuttings, green ash, boxelder, green ash, golden willow. In block 2 the trees were 4 feet apart in the rows and the rows were 8 feet apart. Here the arrangement of species was as follows: Golden willow, boxelder, poplar, American elm, green ash, boxelder, Chinese elm, poplar cuttings, boxelder, golden willow. Trees that were killed back or that made poor growth were later replaced with trees of the same or different species.

Green ash and American elm survived the best of any of the trees planted in 1917. More than 85 per cent of both species lived and neither was killed back noticeably in any year. Green ash grew very slowly in the 1917 planting, but grew much faster in the later plantings in which more space was allowed between the trees. American elm made about the same growth as boxelder where the latter was not killed back.

Boxelder survived nearly as well as green ash on low ground and on the east side, but except on low ground it was killed back badly on the west side.

Chinese elm made the fastest growth of any of the trees planted in 1917. As large a proportion of the Chinese elm as of the ash and American elm lived; but the Chinese elm was killed back badly in 1927 and 1928, some of the best trees being killed out completely in those years.

Only 35 per cent of the golden willows on the east side of the shelter belt lived. These made good growth after 1920. None of the golden willows on the west side lived except in a shallow ravine that crosses the blocks near the center, and those in the ravine made only a scrubby growth.

In the later plantings northwest poplar made a faster growth than Chinese elm and nearly all that were planted lived. Russian olive and buffaloberry made good growth with no noticeable killing back.

Caragana planted in a row by themselves in 1922 and in the shelter belt in 1927 made fast growth. At least 95 per cent of these lived, and none were killed back.

⁶ Results with Tree Planting at the Sheridan Field Station. 14 pp. diags. Laramie, 1929.

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